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SPECIAL FEATURE ON THE NEW DIGITAL CAMERAS

NDD

SEPTEMBER 1998

Electronics Australia

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Today's cars: how electronics makes them safer

'Front End' for PC sound cards makes digital recording easier

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FPC MAGAZINES
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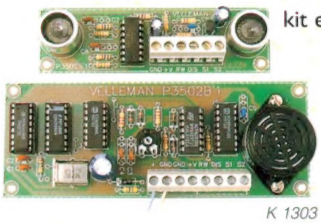
Where do you go for the best in Velleman Kits?

Exclusive to Dick Smith Electronics, these popular Velleman kits are produced and assembled in Belgium, and all come with a re-usable plastic container, pre-screened and pre-drilled PCBs and all components stripped in order of assembly.

HIGH-Q velleman-kit

Parking radar

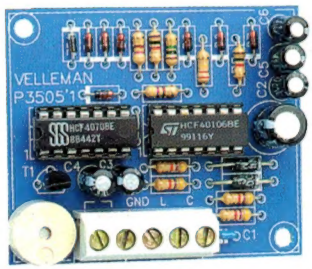


No more parking problems with this kit emitting ultrasonic soundwaves to 'measure' the distance between your car and other obstacles. A signal is generated when the pre-set distance is crossed.
Supply voltage: 10-15V DC/16mA.

K 1303

$64.95

Headlight indicator

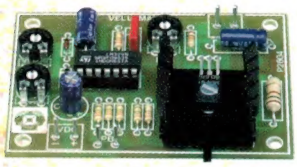


Set this headlight indicator either to indicate the headlights should be switched off after turning off the ignition, or to indicate that the headlights should be switched on once the engine is on. Only three wires needed to hook up.
Supply voltage: 12V DC.

K 1304

$24.95

Kojak siren



Create or imitate sirens of all kinds by adjusting three trimmers. Powerful sound with an additional 2W amplifier on the PCB. Power supply: 8-14V DC.

K 1300

$18.95

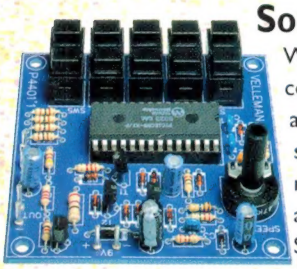
Screen wiper robot

Select up to three different time intervals (2-10-15 seconds) for the windscreen wipers of your car. Manual includes installation instructions for most cars. Relays on PCB.
Requires 12-15V DC.

K 1305

$26.95

Sound generator

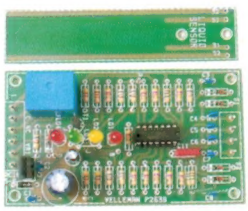


With one output for direct connection to a speaker, and one to a mixer panel or amplifier, generate sound effects like phaser and machine guns, sirens, racing cars and explosions.
Supply voltage: 8-10V DC/100mA, 1W speaker output.

K 1301

$44.95

Liquid level controller



LED control of set fluid level: low, middle, high. Controller: relay automatically switches a pump to keep fluid level between low and high marks. If sensor detects a level too high or low the relay activates a bell or the alarm device. *(Not included)*

K 1307

$29.95

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World of Electronics

Projects and Technical

Columns and Comments

Departments

On the cover

Volvo's S80, just released, features a wealth of safety features — many of them based on electronics. As well as the airbags used in previous models, there's a new Inflatable Curtain that deploys in 25ms, to provide more side impact protection. See our feature story on car safety starting on page 24. (Photo courtesy Volvo Australia)

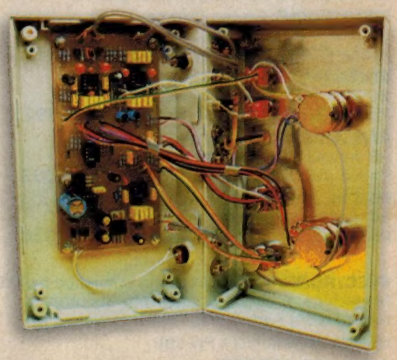
Impressive performance

20 *The new Olympus C-1400L has a 3X zoom, TTL viewfinder & higher-res images. (See our feature on p.14 too)*

Big screen, huge impact...

10 *Pioneer's new plasma display has great impact, as does its price (gulp!)*

Audio recording 'front end'



44 *Like to try digital recording, using your PC? This new project can help...*

Professional Electronics

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Letters to the Editor

Stick with leeches?

Being but a humble technician, I've always entrusted my health to my GP. However as a result of reading your recent Forum series I now realise that my erythrocites are being invaded by alien viruses.

Since your research has obviously provided you with considerable expertise on the topic, I am really desperate for your advice. Do you reckon that I ought purchase Dr Beck's Blood Cleaner, or should I just stick with the leeches? ;-(

John Harvey, Clermont Qld.

Engine cutout legality

A letter in the July edition refers to an engine cutout caused by a broken fan belt as being illegal.

I don't think so. LPG convertors will freeze up in seconds (stopping fuel supply) if the fan belt breaks — and they are legal.

Andrew Caris (via e-mail)

Idea not new

Graham Pratt's idea about using resist ink to print circuit boards directly from a CAD program isn't new (*EA* July 98).

About 10 years ago I was making one-off boards for research using resist ink in a pen plotter and plotting directly onto the copper surface. The resist ink happens to be the same as the ink used by farmers to write numbers on the ear-tags of cattle, and you can buy it cheaply in 200ml bottles (which makes more circuit boards than you will ever need).

The trouble with inkjet printers may be that they are much more particular about the flow qualities of the ink than a plotter pen.

Chris Henderson (via e-mail)

Aristocrat radio

I am rejuvenating a seven valve Aristocrat ESM radio (1930 vintage), and wonder if any of your readers have a circuit diagram or any servicing details (IFT frequencies, etc).

The circuit is a superhet with a triple gang tuning capacitor linking a 6K7G RF stage in front of a 6A8G heptode frequency changer, followed by an (unreadable) IF stage, a 6B6G demodulator and 6V6G output with a 5Y3 HT rectifier and 6G5 magic eye tuning indicator. Apart from the RF stage, the circuit appears broadly similar to that of the RCNZ radio in your magazine issue of September 1994.

The set is powered by a (nominally) 380-0-380V transformer with full wave rectification. 320V DC on the cathode of the 5Y3 rectifier falls to 140V after smoothing by the 2800Ω field coil of the speaker (indicating a reasonable consumption of about 60mA). This voltage is well below the 250V anticipated for the valves, but after the mandatory replacement of paper capacitors, the radio is surprisingly receiving speech and music without distortion.

For your information, I'm a chemical engineer who cut his teeth on home-built TV's using war surplus ex-RAF 1355 receivers and VCR517 tubes in Britain in the early 1950s. The heating from the multitude of VR65's served a dual purpose of keeping the room warm in winter! The inevitable conversion to transistors and ICs through building circuits in *Electronics Australia* over 25 years has not diminished my interest in your articles on thermionic valves.

J.M. Costello, Woronora NSW.

DVD players

Having read your review of the Philips DVD840, I thought I should write. I have been following the development of DVD since the beginning, always knowing that I wanted to buy a player. However, that was put on hold when I read that there would be zones to stop individuals importing, pirating, etc movie titles.

Thankfully the Internet came to the rescue, with many sites describing how to defeat the zone coding in each brand and model of player. Armed with this information, and on a recent holiday in Malaysia, I bought a DVD player (for considerably less than in Australia — $600 US!). Imagine my amazement when told that my purchase had been already modified by the distributor in Malaysia so as to defeat zoning! To prove it, the vendor played me a disc stamped Zone 1, and another Zone 4.

Recently, in an American magazine, it was proudly reported that sales of DVD players and software had overtaken VHS for the first time. With the advent of the

'Net, and shopping on-line, it's not hard to understand why.

Frustrated Australian consumers would be very tempted to buy a DVD player coded for Zone 1 (US and Canada), purely because it guarantees the individual access to more than 2500 movie titles, and interactive games, available now. By contrast, I have been able to source fewer than 20 titles in Australia, with explanations from retailers that "the Copyright holder won't allow that title into Australia". *Stargate* and *The Fifth Element* are two such examples.

Why? What do the copyright holders have to gain? Are they waiting for people to stampede the distributors looking for titles? A typical 'chicken and egg' situation, I think! They won't release the titles until everyone has a player, but people won't buy the players until there's a good range of movies! In the age of the Internet, the Australian distributors of movies are being foolishly parochial.

It is my humble opinion that DVD will fail in Australia, like DCC and MiniDisc. There WILL, however, be booming import activity, with many people opting to buy with their Internet browsers and credit cards. Surf to **www.lasersedge.com**, and you'll see why. The prices, and the range!

Mark Borchers, Melbourne Vic.

It may have worked

Regarding the circuit shown in Fig.4 of July's Vintage Radio, on page 50, surely the circuit *will* work as the A- supply for filaments is not earthed, whereas the bottom of the RF coil IS earthed. Therefore the secondary of coil 5 is not shorted out. It will pump the filament up and down with the audio, whilst holding the grid at earth potential.

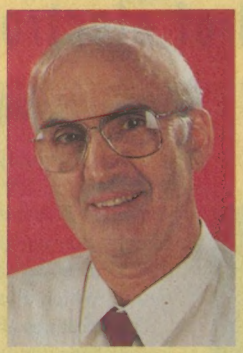
It looks as if all filaments and B supply follow audio with respect to earth and the bottom of the RF coil, if you get my meaning!

Weird, but it probably did work.

Peter Ball (via e-mail) ❖

Letters published in this column express the opinions of the correspondents concerned, and do not necessarily reflect the opinions or policies of the staff or publisher of Electronics Australia. We welcome contributions to this column, but reserve the right to edit letters which are very long or potentially defamatory.

Editorial Viewpoint



From playtoy to invaluable resource tool, in only a few years...

The other day I found myself doing two superficially quite different things, in short order. One was using the World Wide Web or 'WWW' to get some information on a new medication that my wife had been prescribed, by a doctor too busy to answer her questions about it; the other was looking up an article in an old issue of the magazine itself. I was really impressed by the contrast between the two actions, and in particular what they revealed about the dramatic developments that have taken place in computers and information technology, in the last few years.

It turned out that I was able to get some really good information on the medication concerned, from both the manufacturer's web site and also from a consumer information site in the US. There was a full pharmacological rundown, information on how it's believed to work, indications and contra-indications, recommended dosage levels and so on — plus a great deal of information on the research and testing that had gone on in various countries, before it had been approved by bodies like the American FDA.

All of this information was available freely and in very short order, simply by making use of the tremendous resources provided by today's Internet/WWW, its search engines and the databases available at web sites around the world. Just as you can also get excellent up-to-date information on almost any electronic device or component — often faster than looking up a data book.

We tend to take these resources for granted now, don't we? But when I was looking up something in the May 1997 issue, I noticed a couple of articles which reminded me just how far we've come in the last 21-odd years...

Back then, we were building and struggling to understand the first generation of DIY microcomputers and 'evaluation kits', like the Mini Scamp and the Motorola 6800 kit. Even the first true 8-bit personal computers like the Apple II and the Tandy TRS-80 were yet to be released, and many people in electronics thought we were foolish to even bother with 'those little toy computers' — they'd never be of much use!

Little did we even dream of the kind of computing resources that many of us would have on our desktops today — Pentium and Pentium II powered beasts screaming along at 200MHz-plus speeds, with tens of megs of RAM, multi-gigabyte hard disks and high-speed modems, and running all kinds of powerful software.

The same kind of developments have taken place with the internet, of course. Initially it was of interest only to scientists, academics and the military, to link up their big computers and networks. Then it began to be used for international e-mail, and other people started to get involved. Then the WWW appeared and began to blossom, and both the resources and users began to grow exponentially.

Only three or four years ago, I confess that I myself tended to see the WWW as a huge electronic information 'rubbish dump', with a small amount of fact buried almost irretrievably in an enormous amount of uninformed opinion. As with DIY computers 20 years ago, it seemed little more than a hi-tech time waster. But that's all changed, thanks to the development of primary and meta 'search engines', and the enormous amount of genuine information that's been made available.

Things can move pretty quickly from the 'toy' stage to the 'invaluable resource tool' stage, can't they?

Jim Rowe

WHAT'S new
in the ever-changing world of electronics

Sharp Handheld PC features Windows CE 2.0

Sharp Corporation says its new pocket-sized Handheld PC with Windows CE 2.0 is capable of giving a complete multimedia presentation. It features either a mono or a full colour screen, reflecting Sharp's dominance in LCD screens — they claim to produce 60% of those currently sold worldwide. Surprisingly there's also a VGA output, which allows the HPC to facilitate big-screen presentations.

Other features of the HC4100A include an IrDA infra-red port for wireless exchange of data, 8MB of memory and an easy-touch keyboard. An optional extra is a digital camera which slips into the unit's PC card slot.

RRP for the HC4100A with mono colour screen is $999, or with colour screen $1499. The optional digital camera is $599. For more information circle **140** on the reader service card or contact Sharp Corporation, 1 Huntingwood Drive, Huntingwood 2148.

Hi-res multimedia video projector

Hitachi's new CP-X950 is a true XGA resolution (1024 x 768) LCD panel based multimedia projector, claimed to be ideal for business and educational applications where high resolution is essential, such as in the display of fine CAD drawings or high resolution photo images.

A three-panel LCD projector, it uses a Hitachi 'Polarisation Converter' to provides 550 ANSI lumens of light output — one of the brightest displays in its price class. And despite having a weight of only 9kg, it's enclosed in a solid frame that needs no extra mounting brackets if ceiling mounting is desired. The rugged frame also protects the unit from transit damage and distortion. For further protection the zoom lens is fully mounted within the projector case and a built-in lens shutter protects the lens from accidental scratching or worse.

The CP-X950 incorporates a Multi-Scan Panel that accepts two PC inputs, two S-Video and two composite video inputs. These are all automatically detected and the display resolution adjusted

depending on the signal frequency from compressed S-VGA, true XGA and expanded VGA and S-VGA.

Available from authorised Hitachi dealers Australia wide, the CP-X950 has an RRP of $13,499 including tax. For more information circle **145** on the reader service card or contact Hitachi Australia, 13-15 Lyonpark Road, North Ryde 2113.

New palm-size PC has voice control

Casio's new Cassiopeia E-10 is claimed as one of the first palm size PCs powered by Microsoft Windows CE 2.0 to go on sale in Australia, and is claimed to deliver instant access to vital business and personal information whenever and wherever it is needed — plus voice control.

Compact, lightweight and easy to use, it offers users 'seamless desktop synchronisation', infrared (IR) capabilities, 4MB of RAM and 8MB of ROM memory, expandability via its CompactFlash port and a large easy to read 240 x 320 dot LCD screen. Backlighting

provides easy viewing of data even in the dark, while a pop-up handwriting or keyboard panel and taskbar allows up to 30% more viewable screen.

Applications can be launched either by pressing one of the four application buttons, or by voice command using bundled software. Data input and other operations are performed by using a stylus or pressing the on-screen keyboard. Side positioned scrolling, enter and escape buttons make it possible to operate the E-10 with one hand.

The Cassiopeia E-10 has an RRP of $699 and is available at leading resellers and retail stores. For more information circle **149** on the reader service card or contact Mobex, 72-74 Gibbes Street, Chatswood 2067.

High-end CDP/tuner for mobile hifi

Not intended for the average car audio listener, Pioneer's new DEX-P88R component tuner is designed for the audio enthusiast who is not satisfied with a factory-configured system. It is claimed to employ the very latest in car audio features, including 'Sound Q' — a combination of four technologies: Hi-Bit Digital Processing, Legato Link Conversion, Hi-Volt Preamp Outputs, and Zero-Bit Muting.

Hi-Bit Digital Processing apparently combines the best features of both single-bit and 20-bit conversion. It uses a single-bit DAC, but first converts each 16-bit digital 'word' into a new 20-bit word, for enhanced detail. Pioneer's Legato Link circuit then restores the upper harmonics of the music, normally lost during the digital recording process.

The preamp outputs have been enhanced by the newly reworked Hi-Volt (4V) design to provide a cleaner and more powerful signal to the system's amplifiers.

The DEX-P88R will connect to a multiplay CD changer that can be mounted out of sight in the boot, under a seat, or even in the glove box. It also features Pioneer's Supertuner III Quartz-PLL electronic tuner, claimed to offer greater sensitivity, exceptional handling of multi-path interference, and increased resistance to signal intermodulation.

The DEX-P88R has an RRP of $999 and is available at Pioneer dealers throughout Australia. For more information circle **144** on the reader service card or contact Pioneer Electronics Australia, 178-184 Boundary Road, Braeside 3195.

Improved digital camera from Canon

Canon's new PowerShot A5 digital camera is stylish and pocket-sized, offering high resolution images with a low distortion lens, capabilities for high speed capture and storage of images, and a range of memory options.

The PowerShot A5 features a fast 5mm f/2.5 lens that focuses accurately and quickly regardless of lighting conditions. Shutter speeds are from 1/6 to 1/750 second and users have a focusing range from 0.5m - infinity or 90 - 500mm in macro mode. An 810,000 pixel CCD sensor captures the images at optimum resolution, and a dedicated IC then ensures high speed image signal processing so that the image is quickly stored whilst maintaining maximum quality.

Users can select any one of five resolution modes (up to 1024 x 768) to allow optimum balance of resolution and stored image capacity. The camera comes with an 8MB CompactFlash card as standard, holding between 44 - 89 images in fine mode or 125 - 236 images in normal mode (dependent on JPEG compression). Additional Canon CompactFlash memory cards are available from 2MB - 15MB.

The PowerShot A5 comes with both an LCD viewing screen and an optical viewfinder. The low temperature polycrystalline silicon TFT used in the LCD screen ensures exceptionally sharp and bright images, even outdoors.

The camera comes with a range of fully integrated software to extend its imaging capabilities. It measures just 103mm x 68mm x 32.5mm, weighs approximately 230g without batteries and has an RRP of $1299. For more information circle **143** on the reader service card or contact Canon Australia, 1 Thomas Holt Drive, North Ryde 2113

Open-panel hifi speaker is made in Australia

The latest version of Lorpen Audio's HP3 open panel hifi speaker (due out next month) features improved production techniques, revised panel shape, new drivers and more elegant styling. This results in a better looking and sounding speaker while maintaining the attractive pricing.

The HP3 design features four 170mm drivers mounted on a panel of machined 50mm customboard. This open panel handles the upper bass, midrange and lower high frequencies. The dispersion pattern of sound from the panel is described by Lorpen Audio as an enhanced dipole radiating pattern — similar to other panel speakers, but with better horizontal dispersion.

Bass frequencies are handled by an inbuilt subwoofer system at the bottom of the panel, featuring a 210mm bass driver. High frequencies are handled by a dome tweeter mounted in the middle of the panel itself.

This novel design produces a very different sound from conventional box designs. The HP3s are claimed to have a smooth non-fatiguing sound quality, even at loud volume levels, and to be able to resolve subtle low level detail. Stereo imaging is claimed to be excellent. The high efficiency (quoted at 90.5dB) means amplification (both valve and transistor designs) can be chosen for their overall sound quality, not just the power output specification.

The RRP for the new Lorpen Audio HP3 system is $2945.00. For more information circle **147** on the reader service card or contact Lorpen Audio, 11 Moldavia Walk, Osborne 5017.

WHAT'S new in the ever-changing world of electronics

SuperDisk goes USB

Imation Corp has released an external USB version of its 120MB SuperDisk drive, developed in conjunction with Panasonic and announced at the recent Mac World Expo in New York. It was developed specifically to mate with Apple Computer's new iMac computer, and Mac-formatted SuperDisks will be made available to suit it. The drive is also compatible with both 720KB and 1.44MB floppy disks. RRP in the US is around US$189.

Slim 14" LCD monitor

Panasonic has released the new 'Panaflat LC40' 35.6cm (14") LCD computer monitor, boasting colour reproduction and resolution comparable to CRT monitors but with a depth of only 62mm — making it well suited for crowded desks.

The Panaflat LC40 can be used like a conventional monitor and has no special hardware or software requirements. It has an analog interface that plugs into any personal computer's RGB connector. A 15 pin D-sub connector with adapters for Macintosh personal computers ensures compatibility with most computer hardware.

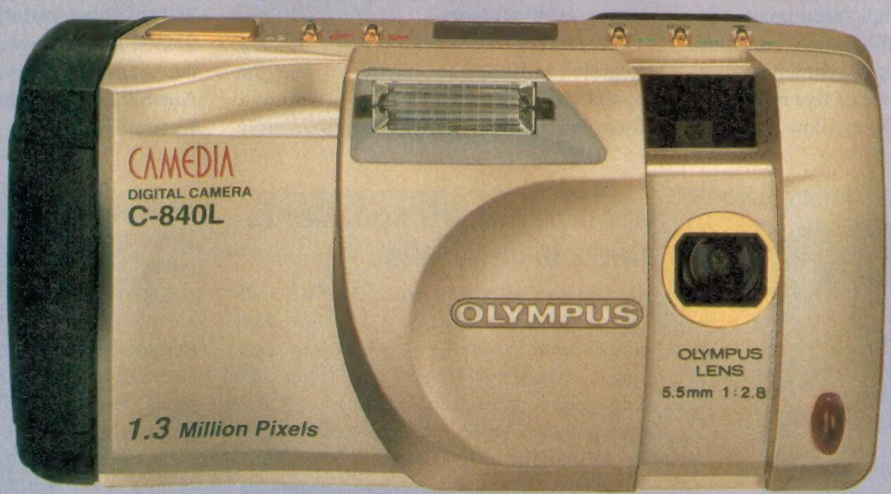
An automatic pixel converter guarantees uniform thickness in both horizontal and vertical lines and natural screen appearance at all resolutions. This marks a major improvement over previous LCD monitors, which could not display 640- or 800-dot signals accurately at full-screen size. All signal resolutions.

'Third generation' Olympus digital camera

Olympus have announced the latest addition to their award-winning range of Camedia digital cameras, the C-840L. This provides a resolution of 1.3 million pixels (1280 x 960) and includes many new features, whilst retaining the popular features of the C-820L (which remains in the range), including its compact lightweight ergonomic design, PAL video out and SmartMedia card usage.

Exceptional image quality is achieved by a high quality 5.5mm all-glass aspherical f/2.8 autofocus lens, low data compression ratios, and a host of other sophisticated Olympus technologies. In addition to a PAL video output for easy viewing of shots on a TV, and the built-in colour LCD, users also have the option of creating prints directly from the camera with the Olympus P-300E dye-sublimation printer via its direct connect capabilities.

Three resolution modes are provided (Standard Quality at 640 x 480, High Quality at 1280 x 960, and Super High Quality 1280 x 960 with least image compression for superior image quality). Exposure control allows users to override the automatic exposure system +/-1 step for lighting compensation, and a sophisticated multi mode flash offers auto, red eye reduction, fill flash, and flash off settings to accommodate a variety of lighting conditions.



Files are saved in an industry standard format (JPEG) that virtually any image editor, word processor or desktop publishing application can use and recognise. With the addition of an optional PCMCIA or floppy disk adapter, images can also be downloaded without needing cables.

Macro focussing has also been improved, with the ability to focus as close as 10cm. There's also a 2X digital mode for closeups in standard resolution. The Olympus C-840L uses 3.3 volt SmartMedia removable media. A 4MB card is included with the camera, but additional 2MB, 4MB, and 8MB cards can be used so there is no restriction on the number of photos that can be captured.

Designed with the consumer in mind, the camera is lightweight at 245g, and very compact with dimensions of 128 x 65 x 45mm. It has a large 51mm smudge-resistant LCD screen and carried an RRP of approximately $1499.

For more information circle **146** on the reader service card or contact R. Gunz (Photographic), Locked Bag 690, Beaconsfield 2014.

olutions smaller than 1024 x 768 are converted to display at full-screen dimensions, ensuring full use of available screen space.

The screen of the LC40 can tilt up to 30° for improved visibility, and a keyboard can rest on the screen's stand to conserve desk space. A cable cover is provided to hide connections at the rear. The LC40 displays 16 million colours with a minimum brightness of 150cd/m^2, and an anti-glare coating prevents reflections and dust build-up. Power consumption is only 45W.

The Panaflat LC40 is available from specialist outlets for an RRP of $5650. For more information circle **148** on the reader service card or contact Panasonic's Customer Care Centre on 132 600.

Ericsson's 'Mobile Communication Solution'

Ericsson Australia has launched its MC 16 handheld computer, said to provide a one-stop, out-of-the-box mobile communication solution. It allows the user to send and receive e-mail, Short Message Service (SMS) and faxes, while also enabling access to the internet and intranets.

The MC 16 comes with the DI 27 infrared modem, which clips onto the base connector of any Ericsson 600 or 700 series mobile phone, linking the phone and MC 16 without cables. The DI 27 is extremely small, weighing less than 10 grams and, unlike traditional PC card modems, doesn't drain power from the computer.

The MC 16 uses Windows CE 2.0 as the operating system, which includes an Inbox application, My Ericsson Phone software and Ericsson Mobile internet. It weighs just 442g with batteries and uses a fast RISC 60MHz processor with 8MB RAM and 10MB ROM.

For more information circle **141** on the reader service card or contact Ericsson Australia.

3.8kW motorised 'ghetto blaster'

Pioneer Electronics says its showpiece 'Muscle Truck' represents the ultimate in car audio innovation, and is set to 'turn heads' at selected Australian car audio and motor/lifestype shows over the next two years.

Essentially the Muscle Truck is a customised 1996 American GMC SLE Crew Cab, fitted out with proprietary voice recognition technology, anti-theft mechanisms, dual video display screens and a slew of amplifiers and speakers producing enough power output to fill the Melbourne Cricket Ground.

The heart of the sound source is five GM-X922 and two GM-X904 class A, four channel amplifiers capable of producing power levels up to 3800 watts. To supply the current needed to drive this arsenal is a bank of heavy duty, heavy current Gel-Cel 70 batteries and 1F capacitors, fitted in a removable tray seated between two-banks of 10 x 12" TSW-1200C subwoofers (20 in total) — giving the vehicle 'more punch than Mike Tyson'.

Additional speakers include a range of mid-range, mid sub and tweeter units. Front end components include Pioneer's CDX-P5000 50-disc Stacker, CD-VC50 Voice Control Unit and DEX-P88R Multi-CD controller/tuner. Total value of the audio components alone exceed $30,000.

Not much room for the family or taking the rubbish to the tip, but a great way of showing off Pioneer's mobile audio gear... ❖

Pioneer's PDP-V401E

Full Colour Plasma Display

This month, hard on the heels of his review of Pioneer's under-$1000 DVD player, our intrepid reviewer Louis Challis had the chance to evaluate the first of their new gee-whiz plasma flat-screen displays to reach these shores. And its performance just about blew him away. There's just one problem: how can he — and most of us, for that matter — contain our frustration until the price of these beasts comes down to a level where we *might* be able to afford one?

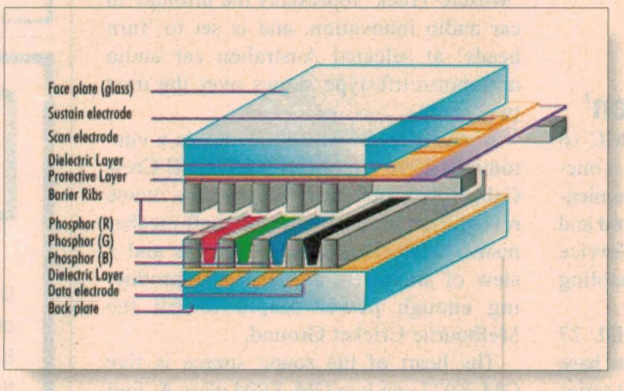
If you read my report on the Pioneer DV505 DVD player last month, you may well recall the degree to which the NEC PlasmaSync 4200W plasma display impressed me. Not only was I excited by the latest complementary advances in video technology, but more significantly I extolled its virtues. Indeed, I was sufficiently impressed that I imparted my feelings to the sales team at Pioneer Australia. I rather brashly suggested that as soon as they received *their* first plasma display, I would welcome the chance to review it!

Needless to say, I had expected some weeks or even months to elapse before they'd take me up on this offer. However it all happened much sooner. In fact it was only a week later that Pioneer expedited the delivery of the very first PDP-V401E into the country, straight to my office...

What could I do? I couldn't lose face and not review it, particularly as they supplemented that delivery with the first unit of their brand new (groundbreaking) DVL-909 combination (or 'combo') player, to assist me in conducting my review. The DVL-909 happens to be the first, and possibly the only, DVD player in the world which simultaneously provides its owner(s) with the ability to play Region-4 DVD's, PAL and NTSC laserdiscs, conventional CDs, the next generation of high resolution CDs, and Video CDs.

But back to the plasma screen. Pioneer's PDP-V401E has an immediate and pragmatic attraction in that, unlike the NEC PlasmaSync 4200W, which has been optimally configured for a 16x9 widescreen format display, the PDP-V401E has been sensibly designed to satisfy the more common conventional 4x3 format — which is the basis for the majority of current Australian and other international TV transmissions. The 4x3 format is also that still preferred for the majority of computer and related video displays.

The PDP-V401E's designers have focused their initial product in satisfying the demanding requirements of the lucrative commercial market for large displays. That market craves for a display system with minimal depth, maximum brightness and one that can simultaneously, or more specifically sequentially, fulfil the diverse requirements of commercial transportation, educational and residential requirements and applications.



A diagram available on Pioneer's web site, giving an idea of the cell construction used in its PDP-V401E plasma screen.

The more critical commercial applications generally impose an added requirement involving the ability to display a computer screen's output in a normally illuminated room. That requirement prejudices the majority of conventional projection TV's and more significantly virtually all rear-projection TV sets, which only really function adequately in an environment with relatively low level illumination.

Pioneer claims to have gone one step further than other plasma display manufacturers. They claim to have achieved the highest brightness level in the world, with an output illumination level of 400cd/m². That illumination is achieved through the adoption of what they describe as being an 'optimum cell structure technology'.

Pioneer also claims to have achieved a high, if not the highest, contrast ratio currently available (150:1), to ensure brilliant colour contrast. This is achieved by the adoption of a special square plasma cell structure, in which each of the complicated individual parallel cell structures is incorporated in minuscule 1.26 x 1.26mm repetitive modules.

Each individual plasma cell in the screen functions on the basis of the application of electric charges to the electrodes on each side of the cellular structure. The charge (or should I say the discharge) between the electrodes in each module then reacts with the rare gas contained within the gap to produce an ultraviolet radiation. It is this radiation of energy which energises the phosphors on the screen, to create the visible light which you observe. The light from each sub-module combines with the light emitted from adjacent pixels to produce the visual images.

Excellent resolution

Each PDP-V401E has a complement of 281,000 individual plasma cells, to generate a picture with excellent resolution, and with what appears to be the largest current 4x3 plasma display picture size currently available. Although the PDP-V401E is 50mm narrower than the width of the NEC PlasmaSync 4200W's screen, its picture is higher, and thus provides an outstanding visual display with conventional 4x3 format TV, video and computer based software.

The PDP-V401E provides a grey scale with 256 increments and an amazing 16.7 million possible colours. I'll have to take their word for that, as I currently lack the ability to put that specific claim to the test. Fortuitously

there are a large number of objective tests that I *am* equipped to perform. Accordingly, I availed myself of the appropriate hardware and software based procedures to put the PDP-V401E through its paces.

One of the PDP-V401E's nicest features is its extremely slim profile. With an overall thickness of only 100mm, and its adoption of a series of five miniature cooling fans along the right hand side of the rear panel (when viewed from behind), it can be placed up close to a rear or supporting wall without significant inhibition.

With a sound reflective rear wall behind, the resulting noise level at a distance of 2m from the face of the display is only 36dB(A). That sound level, although audible in the absence of audible program material is sufficiently low to ensure that you are all but oblivious to the presence of the fans, until you walk up to the display unit and thereby detect their presence.

The PDP-V401E incorporates multiple inputs, which are located in a line along the lower rear edge of the unit's perimeter framing. These provide direct connection for virtually all forms of conventional video signal (NTSC, PAL and SECAM), as well as SVGA or Mac computer graphics inputs. The unit also incorporates an RS-232 port, through which you can exercise computer control of the images.

I examined the display's output when fed with video signal from a Power Mac 9500/120, and the latest generation of SVGA inputs from a 225MHz Pentium II computer. With both of those formats I was able to produce truly superlative displays.

Field trials...

The Pioneer PDP-V401E and Pioneer DVL-909 combo player arrived just in time for the weekend. Fortuitously Columbia Tristar Pictures responded to a long standing request to provide me with a copy of *Matilda*, the first of their G classification DVDs suitable for young children's viewing. As it happens, that was also the weekend on which my grandchildren were sleeping over. I thus had the perfect opportunity to field trial the system.

My grandchildren's response was truly ecstatic, and both the big-screen hardware and the exciting software were an immediate hit. When I finally managed to drag them away from the PDP-V401E, the first question they asked was "When's daddy going to get a TV like *this*?" (That's the one question to which I delicately avoided a response!)

The PDP-V401E's brightness level was so high that we were able to watch the video with all of my living room's full complement of lights and supplementary reading lights switched on. The most exciting aspects of that evening's foray into this new video technology were the PDP-V401E's brightness levels, its outstanding colour balance and its visual ambience, all of which were as close to being optimum as I could have hoped for.

Needless to say, my grandchildren were just as excited as I was. But more significantly, it was obvious that the larger screen size, and its realistic visual impact, created a degree of realism that eclipsed anything they had ever experienced when watching a conventional TV set, or even when viewing a cinema screen.

It was only later, following the children's departure to their respective beds that I was able to sit down and experiment with the plasma display's user controllable settings, using the PDP-V401E's remote control...

Actually I only discovered that there *was* a remote control when I picked up the handbook and noticed it listed — which led me to look for it in its carton. I then discovered that the unit's default settings conformed to the settings that I would have chosen had I selected them myself.

During the objective testing that followed, I was unable to fault the quality of the PDP-V401E's display linearity nor its colour realism. It was only when I sat within 3m of the screen that I was able to observe the presence of individual pixels. There are 281,000 of those, and I had to look carefully before I was able to identify them with still pictures.

The next morning my grandchildren plead-

The Challis Report

ed for yet another DVD, so we briefly viewed half of a 'G rated' NTSC-format DVD on a Region 1 (US) DVD Player. With only 525 vertical lines of resolution, NTSC DVD's provide an inferior picture when compared to the 625 line PAL-based Region 4 software that we had viewed the previous evening.

Following my grandchildren's departure, I was able to devote further time and attention to assessing other parameters that would have been of little interest to a child. Some of those parameters will be of significant interest to some readers, and were evaluated as a result of questions which were initiated by other recently completed reviews. I used both DVD and laser disc based test software to derive the following information:

1. Vertical and horizontal linearity: These proved to be as close to perfection as one could ever desire.
2. Colour smear: This is clearly visible with laserdisc software, but much less evident and almost invisible using NTSC-format DVD test software.
3. Uniformity of grey scale display: This is very good with laserdisc software and quite outstanding with DVD test software.
4. 'Multi-burst' linearity: This exceeds 4MHz with laserdisc software and appears to achieve a marginally higher figure with DVD test software.
5. Contrast ratio between maximum white and maximum black: This is excellent with laserdisc software and again superior with DVD test software.
6. Cooling fan noise emission at various points in the viewing region in front of the display: Virtually inaudible in the zone on the right hand side of the screen, just audible in front of the screen, and readily audible in the zone to the left hand side of the screen — measured level of 36dB(A).
7. Angular range of viewing: This exceeded 145° in the room in which we were viewing the PDP-V401E. Note that the manufacturer claims 160° horizontal and vertical viewing angles.

In summary

Pioneer were kind enough to leave the PDP-V401E and the DVL-909 with me for 10 pleasant days of viewing. During that period, I was able to confirm, and indeed simply cannot deny that the PDP-V401E viewing quality and sense of realism eclipses that of any conventional TV monitor screen, projection TV monitor display, or rear projection TV display that I have yet seen.

The PDP-V401E's plasma display has the ability to uplift and upstage your current perceptions of what you desire for your home cinema or your general (or private) TV viewing. As you will undoubtedly discover when you finally get the opportunity to view one, plasma displays like the PDP-V401E simply set a new standard, and become the benchmark against which we will now assess video quality. ❖

Pioneer PDP-V401E Full Colour Plasma Display

A multiformat plasma-based display screen for both video (PAL/NTSC) and computer graphics (SVGA/MAc). Measures 946 x 740 x 100mm, weighs 30kg (unpacked), displays in 4:3 format.

Good points: *Excellent image resolution (281,000 pixels), very high brightness (400cd/m²) and contrast ratio (150:1), wide viewing angle (160°).*

Bad points: *Low level noise emission from cooling fans. For many of us, price will be the only drawback.*

RRP: *About $17,000.*

Available: *Pioneer dealers, or contact Pioneer Electronics Australia, 178-184 Boundary Road, Braeside 3195.*

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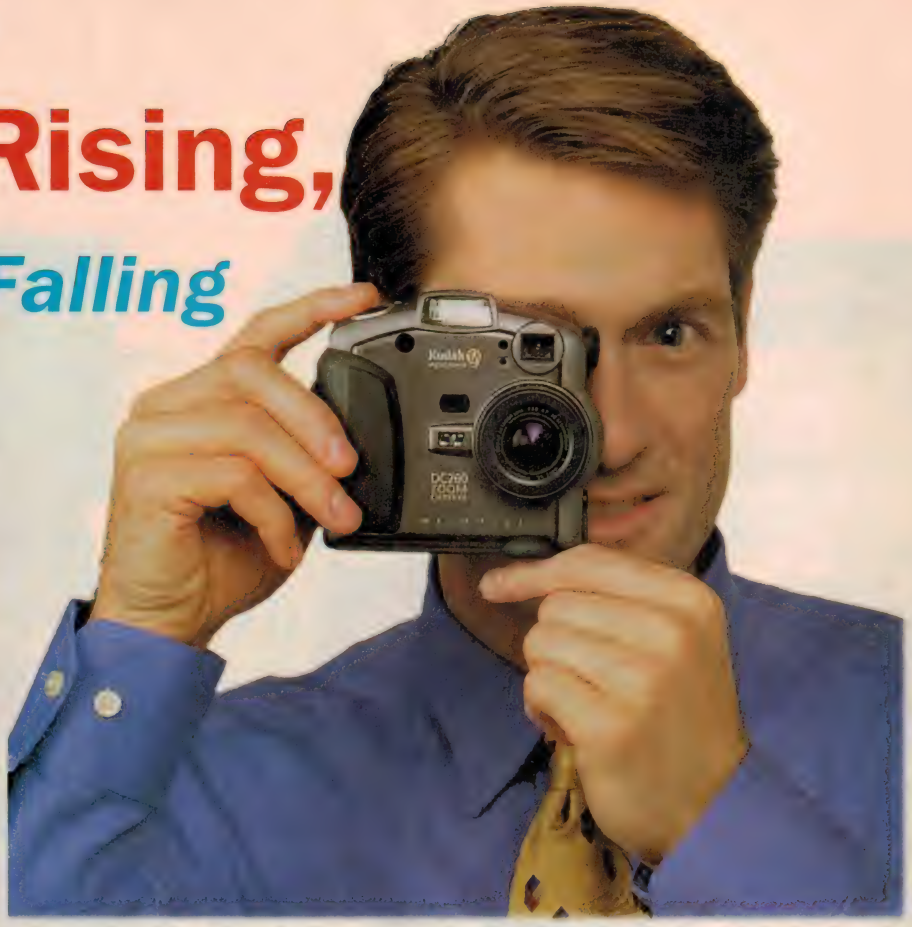


Digital still cameras are now getting quite serious in the consumer market. Their picture quality continues to rise, while prices are descending and sales are rising. While the bulk of happy snappers are yet to swing over, and film technology still has the edge in terms of performance/price, more and more enthusiasts are succumbing to the lure of instant 'megapixel' imaging.

Kodak's new top of the range DC260, with a 1.6-million pixel CCD coupled to a 3X zoom lens.

by Barrie Smith

Are digital cameras a serious competitor to traditional silver halide film cameras? Not by a long chalk — yet.

Incredibly, you can still buy a $5 plastic, fixed focus kiddie's camera, drop a roll of film in and get better 10x15cm prints — judged by serious, critical standards — than most digital cameras on the market below $2000.

So, for the short term — say two or three years — it looks as though digi cams will not so much sit side-by-side or replace the traditional cams, but establish a market sector all their own.

Current market leaders are those from Olympus, Kodak and Sony; but no manufacturer claims to be making money out of the product at this time. So, with much talk — especially in the Australian market — of fingers being burnt by the smaller players, the majors prepared to invest heavily in digital camera development are still hanging in there.

What is becoming apparent is that digital camera sales follow on alongside sales of PCs. A prime case at the moment is New Zealand, which is showing eager growth in both product lines.

The Web is also driving digital cameras; the devices' ability to output a small, adequate resolution file direct to the computer is heaven-sent for eager emailers, attaching all sorts of imagery to their messages. This writer is forced to admit to flooding the network last Christmas with 80 worldwide email messages — photos attached; be thankful you were not on my list!

Digital cameras are definitely not being adopted by the happy family snapper brigade, nor the keen SLR enthusiast — for obvious reasons: as yet, the quality is 'not there'. Many are also put off by the downloading trauma and the fiddling needed to extract photo quality from current inkjet printers.

But, with regard to the latter, inkjet printers are winning a multitude of friends every moment of every day; new models by HP, Canon and Epson are outputting colour and resolution indistinguishable from conventional colour prints in many respects. It is a bit of a fiddle — but one that this writer for one is happy to undertake!

Nikon's Coolpix 900 not only features a swivelling case, for flexibility, but also a 1.3M pixel CCD and a nine-element Nikkor lens.

Megapixel models

The current buzz in the industry centres around which manufacturer has launched a megapixel camera or even a 'megapixel plus' model.

Megapixel? Basically the term means a camera able to output a file of one million pixels. In most units at this level the CCD itself possesses one million picture elements (pixels) so the output is a genuine megapixel picture. But some do 'fudge' — like the Kodak DC120 model, which in truth has an 836,000 pixel CCD, but outputs a 1280 by 960 pixel picture composed of 1,228,000 pixels (1.23M) — accomplished by in-camera interpolation. Other Kodak models — the DC200 and DC210 — have actual 1.01M CCDs (1152 x 864 pixel images).

Above left is the Olympus C-1400L, which boasts a 1.4M pixel CCD coupled to a 3X zoom lens; above right is the Fuji MX-700, with a 1.5MB CCD and a 35mm equivalent lens; and below is the Konica Q-M100, with a 1.08M pixel CCD and 6mm lens.

The newish Fuji MX-700 model boasts a 1.5M pixel CCD (1280 x 1024 pixel image), while its companion model the DS-300 offers 1.3M (1280 x 1000 pixel image).

Konica has its Q-M100, with a 1.08M CCD (1152 x 864 pixel image) — a straightforward camera embellished by a bevy of Photoshop plug-ins to titillate captured images.

Nikon, in its 1.3M CCD Coolpix 900 camera, delivers a 1280 x 960 pixel image with the added cachet of a nine element/seven group Nikkor lens using aspheric glass elements. Three exposure modes are to hand — spot, centre-weighted, matrix.

Sharp-eyed sensors

At this point in a maturing market, the appeal of a CCD of megapixel — or better! — resolution is undeniable. If you are making digital camera images for reproduction in a glossy colour magazine (using a 150 lines per inch dot screen), a 1280 x 1024 pixel image will permit acceptably sharp reproduction to 10.8 x 8.67cm. If sharp-eyed critical assessment — and the test charts — are put aside, it is possible to get a very acceptable A5 (half A4) printed image.

For the home and office user, an image from a camera of this resolution level is easily enlarged to near-A4 page size with high level printers such as Epson's Photo EX inkjet, which boasts 1440 dots per inch resolution on the 'photo gloss' paper. What comes into play is viewing distance for photographs and the like; nobody peruses a 10 x 8 (or an A4) print at less than arm's length.

Raising resolution...

As digital camera manufacturers strive to lift resolution levels, camera software developers are also seeking to help the cause.

It seems that fractals may provide some of the solutions. As mentioned in the text, some cameras employ pixel interpolation to raise their image capture's apparent overall resolution. This action relies on internal processing to create new additional pixels, derived from adjacent CCD pixels.

An exciting approach has also been pursued by the US Altamira Group. In creating Genuine Fractals, the company has developed a plug-in for Adobe Photoshop software which allows the creation of very small files from comparatively large files, and vice-versa. It's essentially a lossless compression system. As an example, a 640 x 480 pixel image of 307KB could be created from a 2000 x 1500 pixel file of around 8MB, and scaled up again at will.

Whilst not being taken up by any camera manufacturer at this stage, fractal techniques look likely to help reduce the size of images transmitted via the Internet — yet maintain and even improve their quality.

Believe it! You can download a free trial version from the company's Web site at **www.altamira-group.com**.

...and lowering it again!

Some camera designers (or is it the marketing people?) seem to have missed an essential point in digital camera strategy: getting the resolution levels up — and with it, final picture sizes — is the name of the game.

In spite of this, the dreaded 'digital zoom' facility has crept in from the world of video camcorders (where levels of digital zoom have reached 100X and more). So we see digital still cameras from Epson, Casio and others incorporate this feature. (All a digital zoom does is effectively crop the CCD sensor image, using digital enlargement of the centre portion. This essentially 'throws away' some of the sensor's resolution...)

The Epson PhotoPC 600 offers a 3X digital zoom, while the yet to be released PC 700 pulls this back to 2X. In the US and Japan Casio's QV-5000SX has a 2X/4X digital zoom; the Fuji MX-700 features a 'playback zoom' of up to 4X, which allows you to closely inspect a shot — but at least it does not crop and enlarge the pixel array as with the Epson models.

Enlarging, say a 1024 x 768 picture by 2X seems a pointless exercise when you can do it with far more control in image editing and manipulation software. Besides, who really wants to throw useful pixels away when in fact you need every one you can get!

At the top end

Olympus long ago found its place in the top three by devoting considerable attention to the lens optics in its models. The C-1400L uses a 2/3-inch CCD (most other models use a 1/3" CCD) containing 1,410,000 pixels, creating a 1280 x 1024 pixel image. The lens is all-glass and uses aspherical elements to apply a high level of correction; its optical resolution of 160 lines/mm at the centre is close to that of topline 35mm compact film cameras.

Obviously aware that the educated buyer was flocking to the Olympus, Kodak moved into high gear a few months ago by releasing two new cameras.

The Kodak Digital Science DC220 and DC260 zoom digital cameras are the first consumer digital cameras to use a Motorola PowerPC processor to speed image processing and customise camera operations. The DC220 has near-one million pixels (an image of 1152 x 864); while the DC260 has a 1.6 million pixel CCD (1536 x 1024) and can capture enough detail for a photo-realistic 8 x 10" picture. Other niceties include a Burst Feature which can capture in each second up to eight pictures at standard resolution or two pictures at high resolution.

Both cameras allow you to record audio to accompany your photos. A scripting feature can instruct your camera to perform a series of pre-set actions, such as take multiple pictures at pre-set intervals or adopt program camera settings for different picture-taking conditions.

The DC260 has a lens with 3X optical plus 2X digital zoom — this means the unfastidious can 'zoom in' to 6X; the camera offers a useful extra in that it can connect to an external flash, allowing lighting of increased subtlety and power. And notice the very different aspect ratio of 1.5:1 — identical to a 35mm frame.

Above is Sony's Digital Mavica MVC-FD71, which although offering only 640 x 480 resolution also boasts image storage on standard 1.4MB floppy disks. At left is their Mavicap floppy disk recorder, which captures to a floppy disk any image from a PAL camcorder or any video source with an analog output.

Spreading the resolution

A novel and quite fascinating piece of software, PhotoVista (from Live Picture), comes to the rescue of all those keen to create sectional panoramas — and so magnify camera resolution levels.

You begin by shooting a series of linking and overlapping still shots. These can be made with a digital or traditional camera and either input directly from the camera or converted by scanning. The software then embraces the separate pieces of the panorama and 'stitches' together all sections to make a complete, seamless wide image.

To use it is to be amazed at the ingenuity that has obviously gone into its creation; overlapping straight lines meld, horizons blend, adjoining textures merge. The software (Win and Mac) costs $145 (Maxwell Imaging is the distributor).

Other makers in the US have created similar applications, while Olympus and Canon market camera models which have a panorama stitching feature that produces output similar to PhotoVista.

Sony's Digital Mavicas

While this story is ostensibly about megapixel cameras, the inescapable fact is that the whole market is being led by a camera offering only a maximum 640 x 480 pixel image. The Sony Digital Mavica — in two models — accounts for 40% of total digital camera sales worldwide.

The attraction is that the Digital Mavicas use the humble, venerable, universal (and cheap) 3.5-inch HD floppy disk for image storage. It's hard to beat the convenience of shooting a batch of pics, discharging the floppy and then dropping it into your PC's drive to look at them.

And what about the price? Other cameras use PC cards which can cost in the hundreds of dollars. A floppy can cost as little as 50 cents...

Now the company has delivered to market two new models, the FD51 and FD71 — plus a clever unit, the Mavicap, based on Mavica internals.

The higher level FD71 has a progressive scan CCD and a new, thin high-speed floppy disk drive, nearly doubling the speed of recording and playing back images. The camera's 'whole disk copy' mode also makes a copy of an entire disk full of images, with some dexterous disk swapping. The FD71 has internal RAM to accomplish this task — and the feature is not limited to images. Other computer files can be copied from disk to disk as well.

The new camera's standard mode saves up to 40 pictures on a single floppy disk as 640 x 480 PC JPEG files, while the fine mode stores up to 20 at half the compression of the standard mode. For higher-quality pictures, a non-compression mode stores images as a near-megabyte BMP file.

The FD71 also has an e-mail mode that reduces the size of the image to 320 x 240 for smaller file size and faster transmission.

Borrowing on Sony's camcorder expertise, the Mavica has a 10X optical zoom lens, macro capability and a manual focus ring for accurate focusing; and a full-motion, 2.5" colour LCD display viewfinder with a solar window. The solar window uses sunlight to enhance backlight for the display, for better viewing in bright light with minimal battery drain.

The camera has a huge advantage in the digital still camera market by employing a camcorder battery — the rechargeable InfoLithium unit that powers the taking of up to 500 consecutive shots.

Although it's not a camera, the Mavicap Floppy Disk Recorder is interesting because it allows capture of any image from a PAL camcorder or any video source with an analog output, and storage on a standard floppy disk. In effect, then, the floppy disk recorder transforms a camcorder into a dig-

Table 1: A Comparison of Current Models

Manuf/Model	Lens	Shutter Speeds	Pixels/Resolution	Viewfinder	Price(RRP)
Apple					
QuickTake 200	f2.2/5.7mm	1/4-1/5000	350k/640x480	LCD	$995
Agfa					
ePhoto 307	f4/6mm	1/8-1/10,000	307k/640x480	Opt.	$699
ePhoto 780	f4/33mm	1/30-1/10,000	350k/1024x768	Opt/LCD	$999
ePhoto 1280	3X zoom	1/4-1/500	810k/1280x960	LCD	$1799
Canon					
PowerShot 600	f2.5/7mm	1/30-1/500	570k/832x608	Optical	$1299
Casio					
QV-11	f2.8/5.2mm	1/8-1/4000	250k/320x240	LCD	$499
QV-100	f2.8/4.2mm	1/8-1/4000	360k/640x480	LCD	$899
QV-300	f2.6/4.9-11mm	1/8-1/4000	360k/640x480	LCD	$1399
Epson					
Photo PC600	f2.8/5mm	1/4-1/500	810k/1024x768	Optical	$1299
Fuji					
DX-5	f3.1/5.7mm	1/4-1/5000	350k/640x480	Optical	$699
DX-7	f3.1/5.7mm	1/4-1/5000	350k/640x480	Opt/LCD	$899
MX-700	f3.2/35mm	1/4-1/1000	1.5MB/1280x1024	Opt/LCD	$1699
DS-300	f2.5/33-105mm	1/4-1000	1.3MB/1280x1000	Opt	$3860
Hanimex					
DigiPix	f5/5mm	1/30-2000	350k/320x240	LCD	$499
Kodak					
DC50	f2.5/37-111mm	1/16-1/500	380k/765x504	Opt	$1050
DC120	f2.5/38-114mm	1/16-1/500	836k/1280x960	Opt/LCD	$1650
DC200	f4/39mm	1/2-1/362	1.01MB/1152x864	Opt/LCD	$1250
DC210	f2.5/29-58mm	1/2-1/362	1.01MB/1152x864	Opt/LCD	$1650
DC220	f4-16/29-58mm	1/2-1/360	1.01MB/1152x864	Opt/LCD	$1999
DC260	f3-22/38-115mm	1/4-1/400	1.6MB/1536x1024	Opt/LCD	$2499
Konica					
Q-Mini	f2.8/6mm	1/4-1/2000	350k/640x480	LCD	$899
Q-M100	f2.8/6mm	1/8-1/500	1.08MB/1152x872	Opt/LCD	$1200
Minolta					
Dimage V	f5-5.6/2.7X zoom	1/30-1/10,000	350k/640x480	LCD	$1099
Nikon					
Coolpix 100	f4/6.2mm	1/45-1/10,000	330k/512x480	Opt/LCD	$699
Coolpix 300	f4/6.2mm	1/30-1/2500	330k/640x480	Opt/LCD	$999
Coolpix 600	f2.8/5mm	1/4-1/2000	800k/1024x768	Opt/LCD	$1195
Coolpix 900	f2.4-3.6/5.8-17.4mm	1/4-1/750	1.3MB/1280x960	Opt/LCD	$1895
Olympus					
C-420L	f2.8/5mm	1/4-1/10,000	350k/640x480	Opt/LCD	$979
C-820L	f2.8/5mm	1/4-1/500	810k/1024x768	Opt/LCD	$1299
C-840L	f2.8/5.5mm	1/2-1/500	1.31MB/1280x960	Opt/LCD	$1499
C-1000L	2.8/3X zoom	1/4-1/10,000	850k/1024x768	TTL/LCD	$1999
C-1400L	f2.8/3X zoom	1/4-1/10,000	1.41MB./1280x1024	TTL/LCD	$2499
Pentax					
EI-C90	f2.8/5.2mm	1/8-1/1000	410k/768x560	Opt/LCD	$999
Ricoh					
RDC-300	f3.8/4mm	1/4-1/16,000	350k/640x480	LCD	$799
RDC-300Z	f3.8/5-15mm	1/4-1/16,000	350k/640x480	LCD	$999
RDC-4300	f2.8-4.7/5.6-16.8mm	NA-1/500	1.32MB/1280x960	LCD	$1799
Sanyo					
VPC-G100	f2.8/5mm	1/4-1/10,000	350k/640x480	Opt/LCD	$899
VPC-G200	f2.8/5mm	1/4-1/10,000	350k/640x480	Opt/LCD	$1299
VPC-X300	f2.8/5mm	1/4-1/500	810k/1024x768	Opt/LCD	$1399
Sony					
MVC-FD51	f2/4.8mm	1/60-1/4000	380k/640x480	LCD	$1149
MVC-FD71	f1.8/4.2-42mm	1/60-1/4000	380k/640x480	LCD	$1599

Notes: Some cameras appear on the market as rebadged models: Konica's Q-mini, Canon PowerShot 350 and Panasonic's DCF1A are, for all intents and purposes, identical — as is Hewlett-Packard's HP.

ital still camera.

The unit has composite and S-video in/outputs.

So where are we?

There's no doubt that digital cameras are now, from a marketing point of view, a viable product. In Australia alone sales in 1998 are expected to reach 35,000 — up by 40% from 1997's 25,000 figure.

They are being increasingly accepted in business and education circles; because of this, there is possibly less criticism applied to their technical shortcomings.

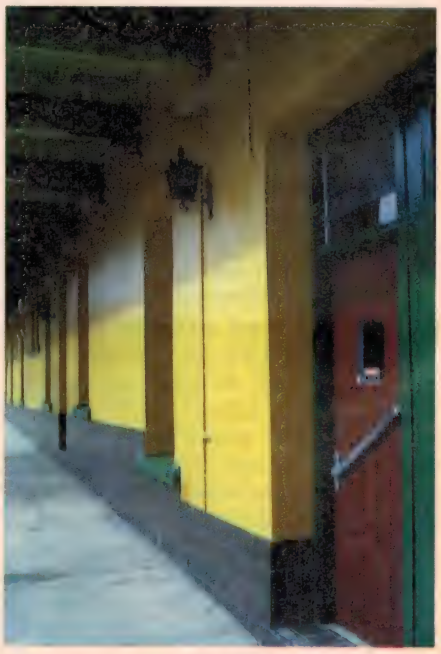
All the same, it's doubtful if a keen amateur photographer, let alone a pro, would accept their remaining deficiencies. Like:

- Virtually all of the latest digi cams sport an LCD finder; these draw power at an alarming rate. The hapless alkaline cells frequently supplied with digi cams are totally inadequate for the task. The ideal answer seems to be the camcorder batteries employed by Sony and Canon in their new models; high shot numbers and easy recharging are their attractive benefits.
- The rated speed of all consumer camera CCDs is far too low for general use; Nikon's Coolpix 900 camera rates its CCD as equivalent to ISO 64 — remember Kodachrome 64? Most other models go only to ISO 100, which is still not too wonderful.
- In poor light conditions the built-in flash *can* save the day — but most are too low in output for wide shots.
- The opposing standards of PC memory cards — SanDisk's CompactFlash and Toshiba's SmartMedia — is a problem. Some cameras use one, the rest use the other — with no converter between. Now it seems likely Sony will develop a 'super-floppy' capable of 200MB!

It will certainly be interesting to see what the future holds in this fast-moving market area.

(Barrie Smith is editor of *Australian Digital Camera* magazine.) ❖

Above is a night shot taken with the Fuji MX-700, which sports an image resolution of 1.3 million pixels. At left is an image taken with the Nikon Coolpix 900 camera, which offers an image resolution of 1280 x 960 pixels. Below is a shot of the Braidwood hotel, taken with a Kodak DC200 — with 1.01 megapixel CCD (1152 x 864).



CMOS sensors?

In our previous report on digital cameras (*EA* December 97), mention was made of the attractions of CMOS image sensors.

Vivitar's ViviCam 3100 is attracting attention in the US. It has an 800,000 pixel CMOS sensor, with a 1920 x 1600 pixel output image, and is claimed to offer 'advanced 30 bit, four colour performance'...

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- **"LaserAsia"** – a Asian trade fair for laser technology and technical optics, co-organized with MMI
- **"Asian Electronics Forum"** – for the latest market trends and technological developments
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(EA)

Olympus Camedia C-1400L Digital Camera

There's no doubt that Olympus is continuing to take a leading role in the accelerating development of digital cameras. We recently had the opportunity to try out its current flagship model, the C-1400L — boasting a 1.4-million pixel CCD sensor, coupled to a 3X power zoom lens with true TTL single-lens reflex viewfinder, and using SmartMedia removable memory cards.

by Jim Rowe

When I reviewed the Olympus C-800L digital camera this time last year, I wrote in the summary box "If it had a zoom lens for easier closeups, an SLR-type viewfinder and perhaps could take extra plug-in cards for even more memory, our wish list would be totally fulfilled". Well, with the new C-1400L they've come very close to doing it.

The C-1400L has an all-glass seven element 3X power zoom lens, covering the focal length range of 9.2 - 28mm (equivalent to 36 - 110mm in familiar 35mm camera terms), and with a maximum aperture varying from f/2.8 at the wide angle end to f/3.9 at the tele end. The rated resolution of the lens in the centre is better than 100 lines/mm, higher than the lenses in many 35mm SLRs. And it has a true SLR-type TTL (through the lens) optical viewfinder, for parallax-free image composition. It even has plug-in SmartMedia memory cards, although these are now *instead of* the fixed internal 6MB memory in the C-800L, rather than in addition to it. Oh well, we can't have everything, I guess...

On the other hand, the C-1400L does have a new and improved 17mm (2/3") progressive-scan 1.4 million pixel CCD image sensor, delivering a maximum image resolution of 1280 x 1024 pixels. That's an improvement of about 66% over the interlaced-scan CCD used in the C-800L, which delivered a maximum resolution of 1024 x 768 pixels. And the progressive-scan technology does provide improved colour rendition and reduced fringing.

A handheld shot (HQ mode) with the zoom lens at the tele end, taken on the seashore of Botany Bay, on a dull afternoon.

As before, the C-1400L offers such nice features as autofocus (by contrast detection), spot TTL exposure metering and compensation for back lighting (seven steps). The lens also features a special Olympus compact prism for the SLR system, reducing overall weight and eliminating the moving mirror and its mechanical shock.

The lens again has a macro range, focussing from 300mm to 600mm in addition to the normal range of 600mm - infinity. This doesn't let you get quite as close as the 200mm of the C-800L, but on the other hand the longer focal length brings you visually closer. There's two 'Quick Focus' settings of either 400mm or 2.5m, to speed up

shooting in typical situations.

The zoom lens fitted to the C-1400L actually seems to have only two aperture settings, f/2.8-3.9 and f/5.6-7.8. The remaining exposure adjustment seems to be via shutter speeds, which vary between 1/4 and 1/10,000th of a second. Not that the user is normally aware of this, of course. The effective sensitivity of the camera's CCD sensor is ISO 100 — not super sensitive, but OK for a lot of photography.

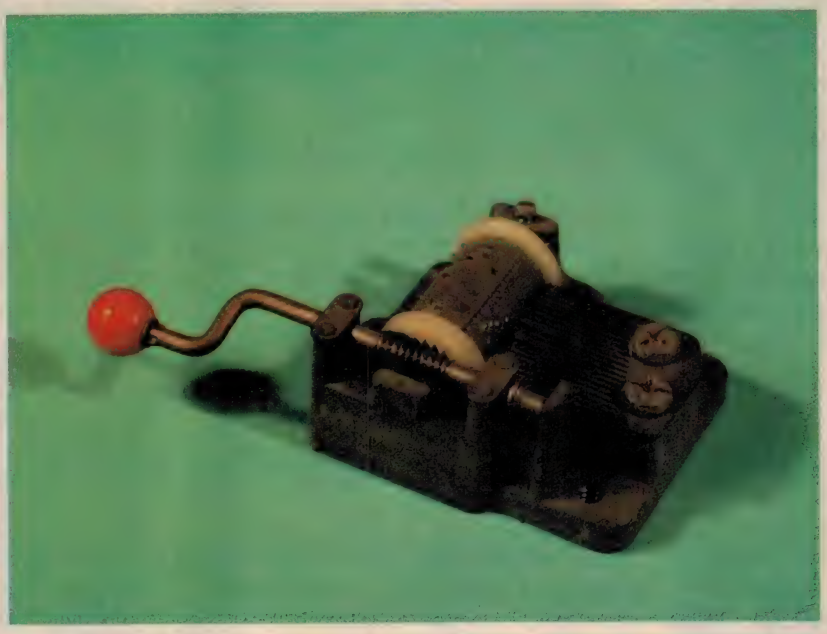
As noted the C-1400L stores its images in slim SmartMedia removable memory cards (also known as SSFDCs or 'Solid State Floppy Disk Cards). These operate on 3.3V and are made by Toshiba. They slip into a slot at the right-hand rear of the camera, accessed via a swing-out door. The C-1400L comes complete with a 4MB card which can store between four and 49 images depending on the resolution mode you've set.

There are three resolution modes available on the C-1400L, labelled SQ, HQ and SHQ in ascending order of effective image resolution (and file size/downloading time). SQ or 'standard quality' gives 640 x 512 pixel images, and it's this mode in which the 4MB memory card will store 49 images. The HQ or 'high quality' and SHQ or 'super high quality' modes both deliver images of 1280 x 1024 pixels, but with greater or lesser amounts of compression respectively. It's in the SHQ mode that the 4MB card will only store four images; in HQ mode this rises to 12 images.

So although the C-1400L does offer considerably better image resolution than say the C-800L, plus the convenience of SLR/TTL operation and a zoom lens, there is a price to pay in terms of image storage with the included 4MB memory card. With the C-800L, you could store up to 30 images of 1024 x 768 pixels in the built-in 6MB memory.

Of course with the C-1400L you can always get additional 2MB and 4MB cards, and swap cards as they become filled. Olympus also notes in its literature that 8MB and larger cards are likely to be available soon.

Another important advantage of using the removable SmartMedia cards is that they provide an additional avenue for downloading the images to your computer. In fact one of the optional accessories Olympus has available for use with the C-1400L and its other models using SmartMedia memory cards is a special adaptor which accepts the cards and slips into a standard 3.5" floppy disk drive, to allow the PC to read from and write to them directly, as if they were a floppy. (You need to load a small driver utility to do this — the utility is supplied on floppy as part of the adaptor kit.)



A closeup taken with the macro facility, at minimum distance. The colour temperature is low as incandescent lamps were used.

Downloading images via the card adaptor is potentially rather faster than using the RS-232C serial cable system used with the C-800L and other earlier models, but the C-1400L still provides this option if you prefer. Or if you have a machine running Windows NT4, with which the adaptor utility isn't compatible...

By the way the C-1400L also has a high speed parallel output port, which can be used to download images directly to the optional Olympus P-300E dye sublimation printer. That way, you can get colour prints immediately, with no need for a PC.

The C-1400L also includes a flip-up variable output electronic flash, with three operating modes: autoflash (fire when needed), fill (always flash) and red-eye reduction (multiple flashes, to reduce a subject's pupil size). Needless to say the flash is automatically disabled in the 'down' position.

Other features continued in the C-1400L include a 45mm diagonal TFT colour LCD on the rear of the camera, to allow convenient reviewing of the shots you've taken; automatic time and date 'stamping' of each shot; the ability to selectively erase unwanted shots from memory, to free space for more shots; and focus locking with the release button pressed halfway in. As with earlier Olympus models

At the rear, there's a 45mm TFT LCD screen for reviewing your pictures, as well as the TTL viewfinder — which has dioptre adjustment, by the way. The camera is quite intuitive to use.

it's powered from four AA-size batteries, of either the alkaline or NiMH or NiCad type.

The C-1400L is compact, measuring 115 x 130 x 83mm and weighing a modest 470g without batteries or memory card. It comes complete with lens cap, carrying strap, batteries, RS-232C serial cable (with Mac adaptor), a 4MB SmartMedia card, manuals and two CD-ROMs containing the Olympus utility software and a bundled image editing application (Adobe's Photo Deluxe).

Options available include an AC power adaptor, a set of NiMH rechargable batteries, a battery charger to suit, a carrying case, the SmartMedia floppy adaptor kit and of course the P-300E colour printer.

Trying it out

Olympus distributor R. Gunz (Photographic) very kindly made a sample C-1400L available for a few days, so I could try it out for myself. I was able to try it in a variety of situations, and compare its performance with other cameras I've used of both the film and digital type. Frankly I'm most impressed. The image quality is excellent, particularly in the top SHQ mode but also in the HQ mode. There seems to be very little of the edge fringing visible on earlier models, and the colour gradation also seems a lot smoother.

I have the impression that the zoom lens sharpness isn't *quite* as good as on the C-800L's fixed 5mm lens, especially at the tele end, but it's still very good indeed. Hopefully you'll get at least a reasonable idea of the image quality possible from the sample shots included here — which are not retouched at all, just converted to CMYK format for printing.

Overall the operating convenience and the potential image quality achievable with the C-1400L seem very comparable with a typical good quality 35mm SLR. About the only area of unfavourable comparison now is cost; by the time you add an extra SmartMedia card or two for storing enough shots for a trip or whatever, you're still paying a considerable premium for the convenience of digital photography. Hopefully this will continue to improve with time.

All the same, Santa can certainly bring *me* a C-1400L if his budget allows. And if you get a chance to try one out for yourself, you'll very likely want one too... ❖

Olympus Camedia C-1400L Digital Camera

An advanced digital still camera taking images at up to 1280 x 1024 pixel resolution. Features a seven-element 3X power zoom lens (equivalent to 36 - 110mm on a 35mm camera), with true SLR-type viewfinder, autofocus and TTL spot metering. Stores images in removable SmartMedia memory cards. Built-in flash and 45mm colour TFT LCD screen for reviewing images.

Good points: High image resolution, colour rendition with improved progressive scan CCD sensor; zero parallax error with SLR viewfinder. Fast image downloading via SmartMedia floppy adaptor. Basically, excellent image quality and operating convenience.

Bad points: Very little, apart from the price.

RRP: $2499.

Available: From digital camera dealers, some photographic stores. For your nearest supplier contact distributor R. Gunz (Photographic), 2/26-34 Dunning Avenue, Rosebery 2018; phone (02) 9935 6600 or fax (02) 9935 6622.

MicroGram Computers

PCMCIA Video Capture Card

PCMCIA Video Capture card complete with software. Designed to provide smooth, full-motion video for applications such as Video Mail, Video Conferencing or Full-Motion Video Capture to AVI file format. The Video Capture card is WIN 95/98 compatible for easy installation & setup. Provides 640 x 480 resolution with 30fps capture rate.

Cat. 3375 **PCMCIA Video Capture Card** $739

VGA Monitor Splitters

These splitter modules enable up to 16 monitors to share the same information of a host PC simultaneously. The ideal way of providing multiple displays in training rooms, airport terminals, stock rooms, clubs, etc. The splitter may be up to 15m from the computer while the monitor may be up to 100m from the splitter for the 2 way module & up to 50m for 4, 8, 12 & 16 way modules. They are suitable for VGA, Super VGA and XVGA monitors.

Cat. 3070	**VGA Splitter 2 Way**	$269
Cat. 3055	**VGA Splitter 4 Way**	$336
Cat. 3056	**VGA Splitter 8 Way**	$574
Cat. 3349	**VGA Splitter 12 way**	$750
Cat. 3350	**VGA Splitter 16 way**	$900

PCI Plug & Play Serial Cards

Provide 4 RS232 Serial ports with 16650 UARTs (32Byte FIFO buffer). Data transfer is from 50 to 921,600 Baud. The I/O address is set automatically and the IRQ is set by the motherboard, the ports share one IRQ. Drivers are provided for Win 95/98 and Win NT4.x/5.x. An adapter cable with four DB25F connectors is included.

Cat. 2616	**1 Port RS232 16550 PnP PCI**	$185
Cat. 2617	**2 Port RS232 16550 PnP PCI**	$225
Cat. 2656	**4 Port RS232 16650 PnP PCI**	$425
Cat. 2657	**8 Port RS232 16650 PnP PCI**	$699

4 Port USB Hub

A self powered USB hub that has one up-stream port & four down-stream ports. It supports both full speed (12M bps) and low speed (1.5M bps) devices & is compatible with the USB 1.0 Specification. It also supports both self-powered & bus-powered modes. It has overcurrent detection & power ready LEDs for each port.

Cat. 2628 **USB Hub 4 Port** $169

10/100Mbps Ethernet Cards

Able to auto sense either 10Mbs or 100Mbs operation, this PnP PCI Ethernet card uses the Bus Master architecture to maximise throughput.

Cat. 11282	**Ethernet Card PCI UTP/STP 10/100Mbps**	$59
Cat. 11271	**Ethernet Card PCI BNC UTP/STP**	$39

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Serial to Fibre Optic Converter

The fibre optic converter allows serial input signals to be converted to fibre optic signals for long distance, high speed and high quality communication. There are 3 LED indicators which correspond to RxD, CTS and power signals.

Cat. 15074	**RS422/485 to Fibre Optic Converter**	$499
Cat. 15073	**RS232 to Fibre Optic Converter**	$499

100Mbps Ethernet 5 Port Hub Card

Mounts on the back plane of a computer but does not plug into a slot, it only connects to the power supply. No separate case and power supply means reduced costs, plus everything is kept neat & tidy inside the computer.

Cat. 11294	**Ethernet Hub Card 5 Port UTP 100Mbps**	$259
Cat. 11287	**Ethernet Hub Card 5 Port UTP 10Mbps**	$99

10Mbps Ethernet 5 Port Hub & LAN Card

Internal PCI Plug & Play 5 Port hub and LAN card does not require external power supply and is a cost effective solution for SOHO users. One port can be used as an uplink port for easy expansion, or used for hub connectivity at the server.

Cat. 11295 **Ethernet Hub & LAN Card 5 Port UTP 10Mb** $109

Active Noise Cancellation

Active Noise Cancelling Technology cancels background noise before it's recorded. A must for Speech Recognition. In fact, most speech recognition software programs bundle a passive noise cancellation microphone. Active is even more effective. It's also better for Internet Telephony & Interactive Gaming.

Cat. 3377	**Headset / Desktop - Ear & Mic ANC100**	$72
Cat. 3379	**Headset - Ear (Either) & Mic ANC500**	$78
Cat. 3380	**Headset - Ear & Mic (Stereo) ANC550**	$110
Cat. 3381	**Headset - Ear & Mic (Disconnect) ANC600**	$125

PCMCIA BAR CODE WAND

Turn your handheld PC into a powerful data collection terminal. Plug the card into your handheld PC (H/PC), launch keyboard emulation software and you can use the pen-like contact scanner wand to copy bar code data directly into any Windows CE program.

Cat. 8672 **PCMCIA Bar Code Wand** $1015

100 Mbps Network Starter Kit

This SOHO Network Starter Kit contains two 10/100Mbps PCI Ethernet cards, one 4 Port 100BaseTx hub, two 5 metre cables & detailed installation manual.

Cat. 11900 **Network Starter Kit** $349

Year 2000 BIOS Card

Even Pentium motherboards are not immune to the Year 2000 bug! The Year 2000 BIOS Card solves the problem of progression from 1999 to 2000 as well as 21st century leap years. It is an 8-bit card which provides year 2000 support for motherboards with a BIOS which only stores the year with two digits. i.e. 97 instead of 1997.

Cat. 3359 **Year 2000 BIOS Card** $129

"Buddy"- Two Users - One PC

Add a second user to your PC. Two users can now concurrently access one PC. Even share one modem & one ISP account! Total Cost of Ownership is much lower & more cost-effective.

Cat. 11639 **VGA PC Share Simultaneously Buddy** $599

Bar Code Slot Reader

An alternative to magnetic card readers (no expensive card writer is required). Ideal for club membership cards etc. A bar code is affixed to the membership card & the card swiped through the reader. It is a keyboard wedge model & the decoder is built-in.

Cat. 8562	**Bar Code Slot Reader KB Wedge**	$459
Cat. 8563	**Bar Code Slot Reader Serial**	$459

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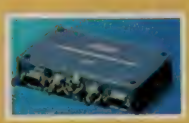

Allows the use of an RGB monitor with either VGA or SVGA output. It is designed for high resolution graphics monitors & has H and V synch signals added to the Green video channel. RGB to SVGA converters are also available.

Cat. 15063	**SVGA to RGB Converter**	$189
Cat. 15064	**RGB to SVGA Converter**	$194

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Reader Info. No 10

Moving People Safely with Electronics - 1

This is the first of two articles discussing the development of electronic solutions in automotive safety applications. As well as an insight into the actual operation of the systems, the enabling technologies which facilitate them will be discussed in order to give the reader an understanding of their complexity. In addition to the better-known systems such as ABS and Airbags, we'll also be covering systems which are currently regarded as 'niche', along with advanced safety systems of the future.

by Ross Bannatyne,
Motorola Transportation Safety & Chassis Systems Division

Safety systems in automobiles have evolved considerably in the last 100 years. Around 1900, the round steering wheel made its debut, oil and gas powered lighting was replaced by electric lamps in 1912 and the 1920s saw the popularity of much safer 'closed' cars, complete with a roof.

The last century has also seen hydraulic braking systems replace crude cable or rod-based systems, the introduction of seat belts (a major safety milestone in the 50s), and the electronic age arrive in the 60s and 70s, to herald a new revolution in automotive safety system improvements.

Chassis control systems

There are several electronically controlled chassis systems which enhance safety by optimizing the interface between the tires and the road surface — either in the longitudinal, lateral or vertical directions. Fig.1 illustrates the popular chassis control systems and the associated directional dynamics on which they act.

To optimize dynamic stability in the longitudinal direction, there are three popular systems: antilock braking systems (ABS), four wheel drive (4WD) and traction control systems. Note that conventional 4WD systems typically use a transfer box with viscous coupling which operates when a difference in the speed of rotation between front and rear wheels occurs. The electronically controlled system is more efficient, as considerable slip is not required before the 4WD operates and a better optimization of driveline torsion, traction and braking capacity may be achieved.

In the vertical direction, roll stabilization and active-suspension systems may be implemented, although these are still in their infancy in terms of the actual number of vehicles which include such systems. A sensor to detect the roll motion of the vehicle could also be employed in order to implement a rollover protection system, enabling the deployment of hidden rollover bars in a convertible in the event of an accident. The same sensor could be used with the airbag system in order to determine when a roof airbag should be fired, as well as the new 'inflator curtain' type airbags which protect occupants from glass splinters and intrusion during a rollover crash.

Lateral stability is the third directional dynamic factor in overall vehicle chassis control and safety. As well as four-wheel steering (4WS), which increases stability whilst cornering at high speed, new systems are being introduced to compensate for

Safety features of current model Holdens include airbag protection for both front passenger and driver, activated by deceleration sensors. (Courtesy Holden Ltd.)

Not surprisingly, Volvo's new S80 boasts a raft of safety features, with electronics playing a crucial role. The company has enhanced its SIPS (Side Impact Protection System) with a new Inflatable Curtain, which inflates in 25ms to increase protection against head and neck injuries. (Courtesy Volvo Car Australia)

understeer or oversteer by the driver. The industry has settled on the name 'electronic stability program' (ESP) for these systems, after being referred to as many names such as Integrated Vehicle Dynamics, Automatic Stability Management Systems, and others. ESP will be discussed later in this article.

Taking the concepts of ESP slightly further, a fully integrated chassis control system would control the functions of suspension, steering and braking seamlessly and would require real-time information on all six degrees of freedom of the vehicle as well as information on the status of each system's control variables and a real-time communication link with other relevant systems such as the powertrain. It is normal today for the traction control system to communicate to the powertrain system in order to adjust throttle angle whilst applying braking forces to achieve optimum traction. It is expected that one system will control the interoperability of all of these related subsystems in the near future.

Antilock braking

The first electronically controlled safety feature which became mainstream was antilock braking systems (ABS). The historical significance of this system is notable — ABS is arguably the most important advancement in automotive braking technology since the development of hydraulic braking.

After early mechanical implementation of ABS in trains and aircraft, analog-based controllers were implemented on several vehicles in Europe and the United States. The analog-based units however had limited performance capabilities, were not completely reliable, and were expensive. Digitally controlled ABS systems were adopted in the 80s and had excellent performance, excellent reliability and increasingly lower costs. A block diagram of an ABS Electronic Control Unit is shown in Fig.2.

The block diagram is generic and it should be noted that there is an almost infinite combination of how the main functions can be partitioned in silicon chips. The most common approach is a mix between established 'off-the-shelf' products and custom devices such as advanced ASICs. In certain cases a customized silicon solution can lead to a significant competitive advantage.

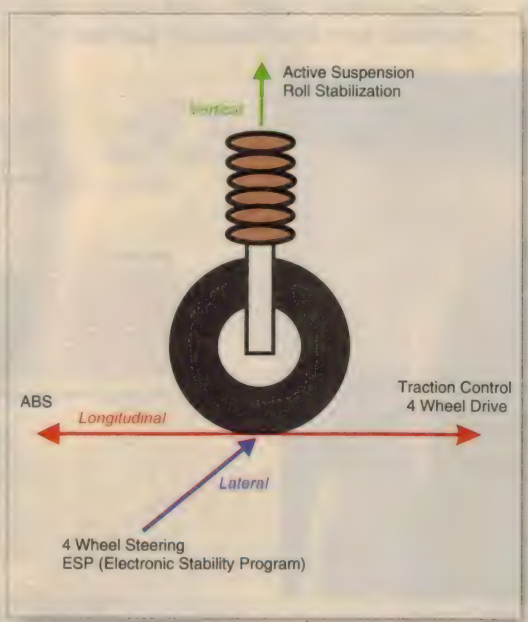


Fig.1: Modern vehicles include electronic systems which control and stabilise chassis movement in all three axes.

There is a clearly defined relationship between the slip ratio of the wheels and the coefficient of friction of the road surface. The ABS control system uses information on the wheel speeds to determine the slip ratio, and subsequently ensure that the maximum grip is applied to the road surface in the longitudinal direction — and also that the grip is optimized in the lateral direction when cornering. An algorithm is executed in the microcontroller to determine slippage and determine how the brake pressure should be maintained at each wheel.

The wheel speed sensors are still most commonly the variable reluctance type, which are robust, low cost and well suited for the harsh environment/high temperatures at the wheel. But they do require considerable interfacing. After signal conditioning, the stream of pulses generated by the wheel speed sensors are then fed into timer input channels on the MCU.

A 'fail-safe' microcontroller, shown in Fig.2, is used for plausibility checks and to process certain parts (or sometimes all of) the algorithm in parallel with the main micro. This is to ensure that any possi-

ble failure modes associated with the ECU can be determined by the system. If a failure mode is detected, a relay will be switched to disconnect the electrical system, so that the ABS is disabled and the conventional hydraulic braking (unassisted by ABS) remains. In this respect, the ABS system is a supplementary system which behaves in a fail-silent way should it detect any faults. A warning light is also switched on and often a fault code will be loaded into EEPROM on the MCU.

It's now common for ABS systems to share information with other vehicle systems; hence the requirement for high speed serial communications. For example, the wheel speed information may be sent to the Navigation controller and the throttle pedal travel/position information will often be acquired from the powertrain controller.

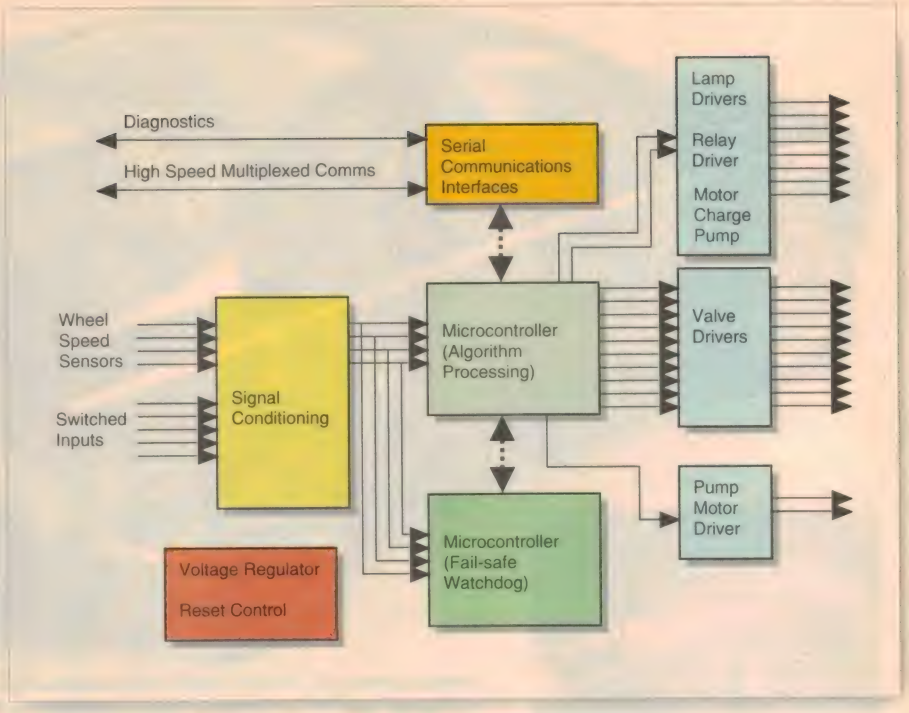


Fig.2: Block diagram of a modern ABS (anti-lock braking system) electronic control unit. The serial comms interfaces are for communication with other vehicle systems.

Airbag system

The other key electronically controlled safety system on today's vehicle is the supplementary restraint or airbag system. Driver and passenger airbags are standard in almost all new vehicles today, with more and more vehicles featuring seat belt pretentioners and side impact airbags. The next step is 'smart' airbags which will sense occupant position and crash severity. These additional sensors will allow the system to tailor the deployment using multi-stage or variable inflators to optimize occupant protection under a wider range of conditions.

Because of the growth in the number of actuators and sensors for smart airbag systems, a distributed airbag system has been proposed which uses a common chipset and communications technology, allowing multiple airbags to be connected to the system easily. The key driver in the development of this system was robustness and reducing the cost. The standard components and interfaces allow expandability, flexibility and reduce the airbag system suppliers time-to-market. The distributed airbag concept is shown in Fig.3.

The system is composed of bus systems which allow easy integration of a number of airbags, switches, sensors or belt tensioners. The buses have been optimized specifically for the airbag application. The electronic control unit in the middle of the diagram includes an MCU for processing the crash detection algorithm, an accelerometer for detection of a crash and a 'safing' sensor.

The safing sensor provides redundancy for added safety, just as the redundant microcontroller in the ABS system performs a 'fail-safe' function. The safing sensor is connected with the firing circuit in such a way that it establishes a logical AND connection. Any firing action of the system remains without effect unless the safing sensor

How the Inflatable Curtain in Volvo's new S80 protects against head and neck injuries. Sensors in the B-pillar and rear wheel arches inflate the curtains within 25ms of a side impact. (Courtesy Volvo Car Australia)

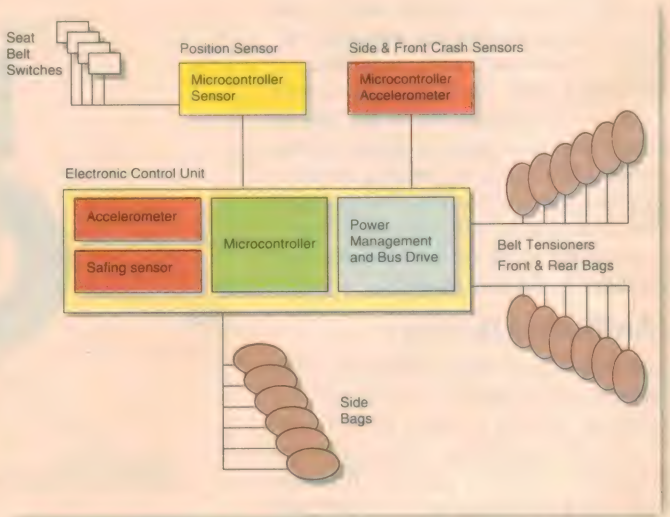


Fig.3: Block diagram of a modern distributed airbag system, showing the way multiple sensors and airbags can be connected. Standard components and interfaces allow expandability and flexibility, and reduce costs.

agrees with the algorithm which operates on the accelerometer signal.

In addition, the system includes a power supply and drivers for the buses.

Electronic Steering

Although it could be argued that the steering system is not, strictly speaking, a safety system, there is no argument that it is a safety-critical system — and as such requires carefully implemented electronic controls. The steering system will, in the future, be closely integrated with other chassis control functions such as braking and suspension controls, to form an overall chassis control system. For this reason, the steering system has been included in this article on safety electronics; its electrification will one day enable the integrated system to steer out of trouble automatically.

There is currently a trend towards implementing direct-assist electric motor steering systems, from the more conventional electro-hydraulic power steering systems. In the event of a system fault, the direct-assist system requires additional safety considerations to ensure that the driver must always overcome any motor torque required to retain control of the steering. In this respect, unlike the ABS system, the direct-assist system must be fault-tolerant — in the event of a failure, steerability must be maintained. For this reason, additional protective elements are designed into the controller (typically smart diagnostics). Both systems are shown in Fig.4.

Both systems have similar controller architectures, which include MCUs and power stages, although the requirements of theses components will differ depending on the motor type and its associated control strategy. A simple PM (permanent magnet) DC motor would typically be controlled by an average performance 8-bit MCU such as a Motorola M68HC11.

Electronic stability

The industry has now settled on the acronym ESP to describe the many varied systems which handle stability management/vehicle dynamics. The first step in integrated vehicle dynamics is to introduce lateral stability as an incremental feature to ABS systems. A lateral stability ESP system aims to counteract extreme understeer or oversteer situations.

Fig.5 represents a vehicle in oversteering and understeering situations. To counteract oversteer by the driver, an automatically generated brake force is applied to the front outer wheel to generate an outward yaw moment. To counteract understeer, automatically generated brake forces are applied to outer front and rear wheels to reduce vehicle speed and generate an inward yaw moment. This action greatly enhances the lateral stability of the vehicle.

A lateral stability ESP system can be implemented with several additional electronic

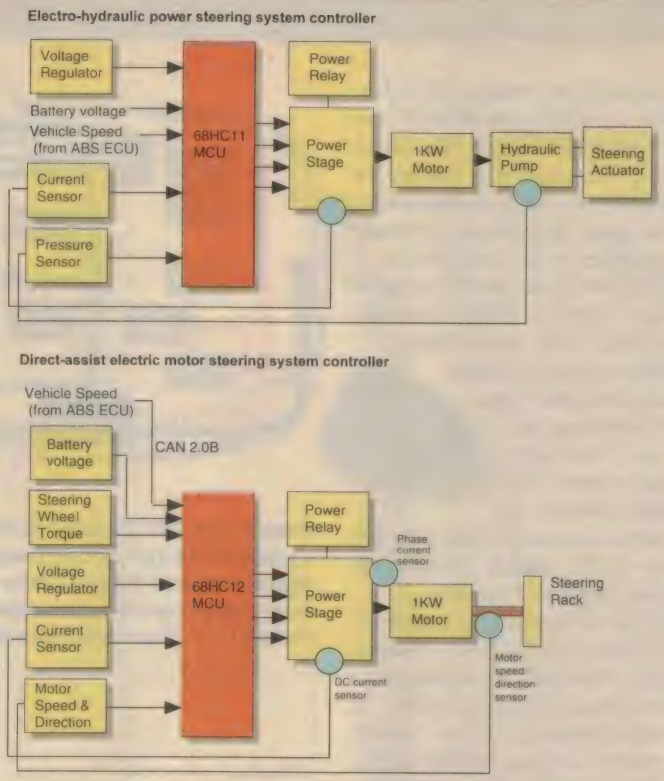


Fig.4 (above): Block diagrams comparing an electro-hydraulic power steering system controller (top) with one using a direct-assist electric motor.

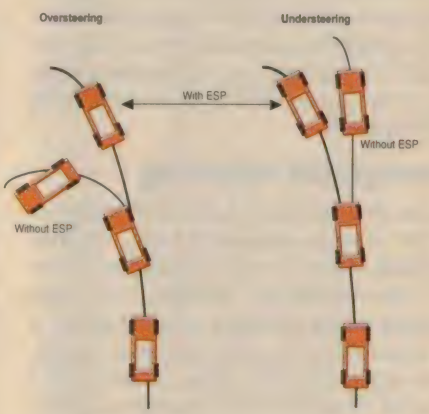
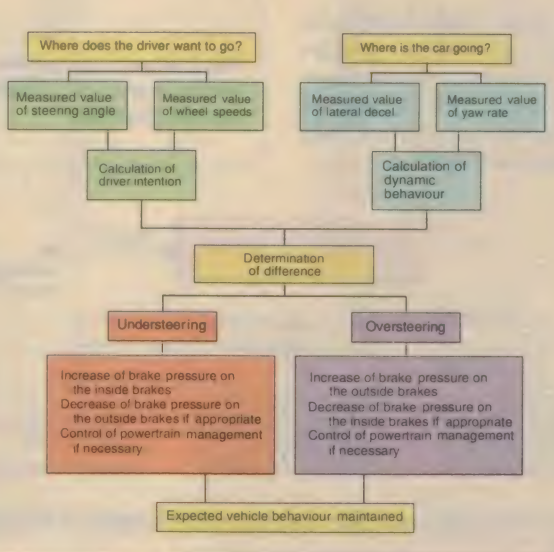


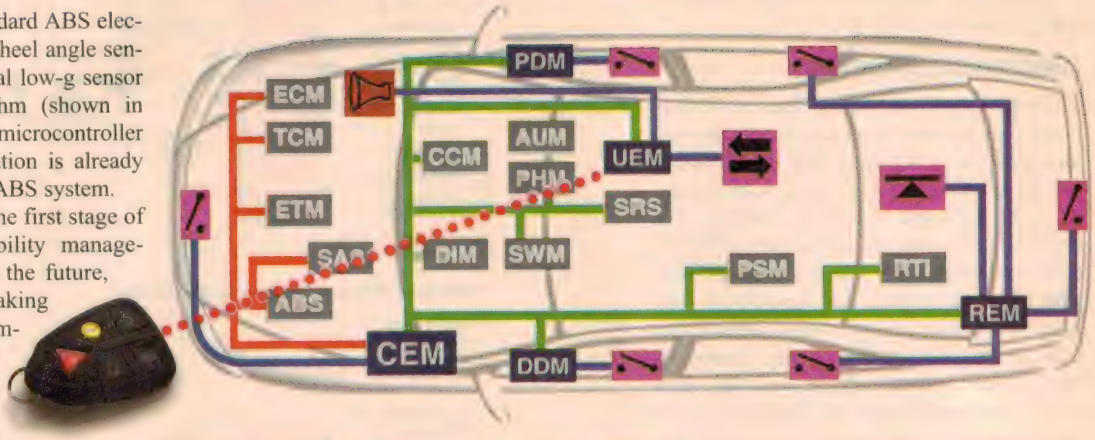
Fig.5 (right): An electronic stability program (ESP) system can be used to improve the vehicle's lateral stability, as an incremental feature to ABS.

Fig.6 (below): The logical algorithm used in a typical EPS system. It can be executed by the ABS microcontroller.



components on top of the standard ABS electronic controller. A steering wheel angle sensor, yaw rate sensor and lateral low-g sensor must be added. The algorithm (shown in Fig.6) is executed by the ABS microcontroller and the wheel speed information is already available as generated by the ABS system.

Lateral stability ESP is only the first stage of fully integrated vehicle stability management systems which will, in the future, integrate together steering, braking and suspension functions seamlessly whilst interacting substantially in real time with the powertrain system. The next logical step will be roll stabilization/active-suspension and then full active control of the chassis system with respect to all six degrees of freedom.



Volvo's new S80 includes no less than 18 different microcomputers, each dedicated to a specific function and all linked via multiplexed digital networks. The green CAN network runs at 125kb/s, while the red CAN network runs at 250kb/s. The remote entry management system uses rotating access codes and includes an electronic immobiliser. (Courtesy Volvo Car Australia)

An example of an advanced fully integrated ESP system is shown in Fig.7. A redundant communications network is employed to provide fault-tolerant communications in linking up each individual chassis control system to a central computer which coordinates the activities of each system. Typically a very powerful PowerPC class of microcontroller would be expected to be used for this overall control function. A communications link would also be used to communicate with other systems.

Emergency reporting

As the modern vehicle consists of a number of bus systems connecting many complex functions, there is a very high degree of system inter-operability available. One such example which enhances occupant safety is an automatic emergency reporting system. This system links the airbag system with a wireless communications system and initiates an emergency call in the event that an airbag is fired.

An operations centre would receive the distress signal and the vehicle's position would be determined using a navigation system typically employing GPS. Dispatch of appropriate emergency services can help avoid further emergency situations.

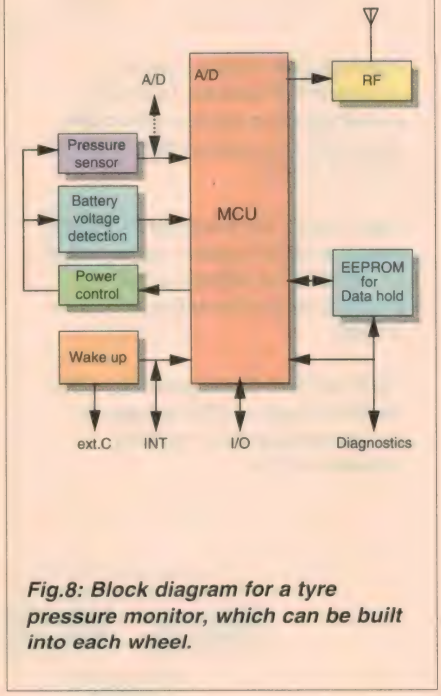


Fig.8: Block diagram for a tyre pressure monitor, which can be built into each wheel.

Tyre pressure monitor

Certain ABS system suppliers have, for some time, offered a system which includes an algorithm which can detect if a tyre's pressure is low. A warning lamp is typically illuminated to alert the driver to this condition. When tyre pressure is reduced, the rolling radius, or distance that the tyre travels per revolution changes. This can be detected using the existing wheel speed sensors.

The introduction of 'run-flat' tyres by the major tyre suppliers will render this algorithm non-operational, as when a puncture occurs with run-flat's, the rolling radius will not change. For this reason a new system is being introduced to detect tyre deflation, which includes a pressure sensor and RF transmitter. The tyre pressure from each wheel is transmitted to the receiver, which is shared with the remote keyless entry (RKE) system.

Additional information may be sent, such as a wheel identifier. This information can be used to help determine when to best rotate the tyres to maintain equal tread wear.

An example circuit used for tyre pressure monitor applications is shown in Fig.8. The module is attached to the tyre valve or may be molded into the tyre wall. A 3V battery would typically be used to provide power, although the system would be used in 'sleep' mode most of the time, only waking up every 30 seconds or so to transmit tyre pressure. FM modulation with a carrier frequency of approximately 300MHz is used for these systems.

In the second of these articles we'll look at systems for occupant sensing, brake assistance, collision warning and avoidance, and also at anticipated future trends in auto safety technology.

(To be continued.) ❖

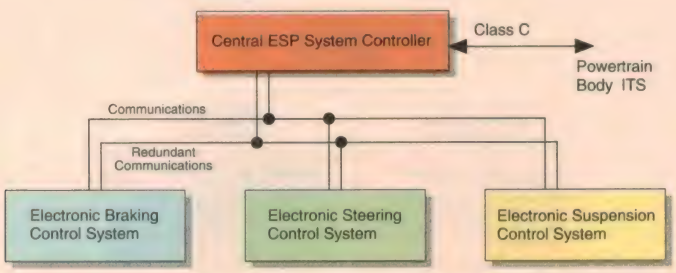


Fig.7: An example of an advanced fully integrated ESP system, of the type soon to become available.

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Tandy ELECTRONICS

Forum

Conducted by Jim Rowe

Ionospheric research isn't new — and timebase correctors that ain't!

Let's have a break this month from such things as 'alternative electrotherapy' devices and EM radiation worries from cellphones, and look at a couple of other topics that have produced interesting reader feedback. One is Tom Moffat's article in the May issue about the US military's HAARP project; the other my own review of a video mixer in the April issue...

I don't know about you, but my impression is that we've probably chewed around the topic of alternative electrotherapies more than enough — for the time being, at least. After a while you start going over the same ground again, don't you? It starts getting tedious, and there's little point to be served because no one is likely to change their views once the tedium factor comes in...

Instead I'd thought about revisiting the subject of possible health risks from cellphones, as I've seen some interesting discussions on the internet. But here again there isn't a great deal of really new information; mainly new ways of looking at things, and an interesting courtcase or two.

On the other hand a couple of letters have turned up on quite different topics, both arising from articles we've published in recent issues of the magazine. So bearing in mind that the original idea of Forum was to allow readers to 'have their say' in an extended sense, reacting to things we publish, I've decided that we'll look at these instead. I feel sure you'll find both letters as interesting as I did.

The first letter comes from Mr John Cameron, of Roseville in NSW. Mr Cameron is responding to Tom Moffat's feature article on the US military's HAARP project, which we ran in the May issue. Here's what he has to say:

I was interested to read Tom Moffat's article on the US HAARP project in the May edition. It brought back memories of my student days at the University of New England (UNE) in northern New South Wales. I thought that your readers may be interested to know that sites like HAARP have run in Australia in the past, and they are not as unusual as Tom implied.

The University of New England (UNE) is located at Armidale, a sheep grazing area in New South Wales, about 500 kilometres north of Sydney. For a number of years from the late 1960s the University Physics department operated an ionospheric research project involving a very large transmitter designed to put energy into the ionosphere. Like HAARP the funding for the project came largely from the US Department of Defense, something that was not advertised in the University environment of the early 1970s. I was involved with the project for a time in 1973.

The main difference between the University of New England facility and the HAARP project is that the university transmitter beam was not steerable and ran at a fixed frequency. We had a single large transmitter and antenna rather than a number of smaller units.

The transmitters, antenna and a small number of equipment buildings were located in a rural area about 10km from the University. If my memory serves me correctly the main transmitter was rated at well over a megawatt in continuous operation with a pulse power of 2 - 3MW. The transmitter was powered by its own 66,000 volt feed from the NSW electrical grid. We were one of the few private buyers of high voltage power in NSW.

Metre-tall valves...

While the main transmitter was simple in design, everything about the transmitter was large. It looked like a normal transmitter built using giant components. Most of it was constructed in a metal lined room. Coils were adjusted using mechanical linkages from outside the room. The transmitter valves stood close to a metre tall.

The antenna was equally large, covering a number of hectares on tall wooden poles over a very large copper ground mat. The antenna directed the transmitter energy straight up to the ionosphere. I seem to recall the antenna had a gain of over 30dB.

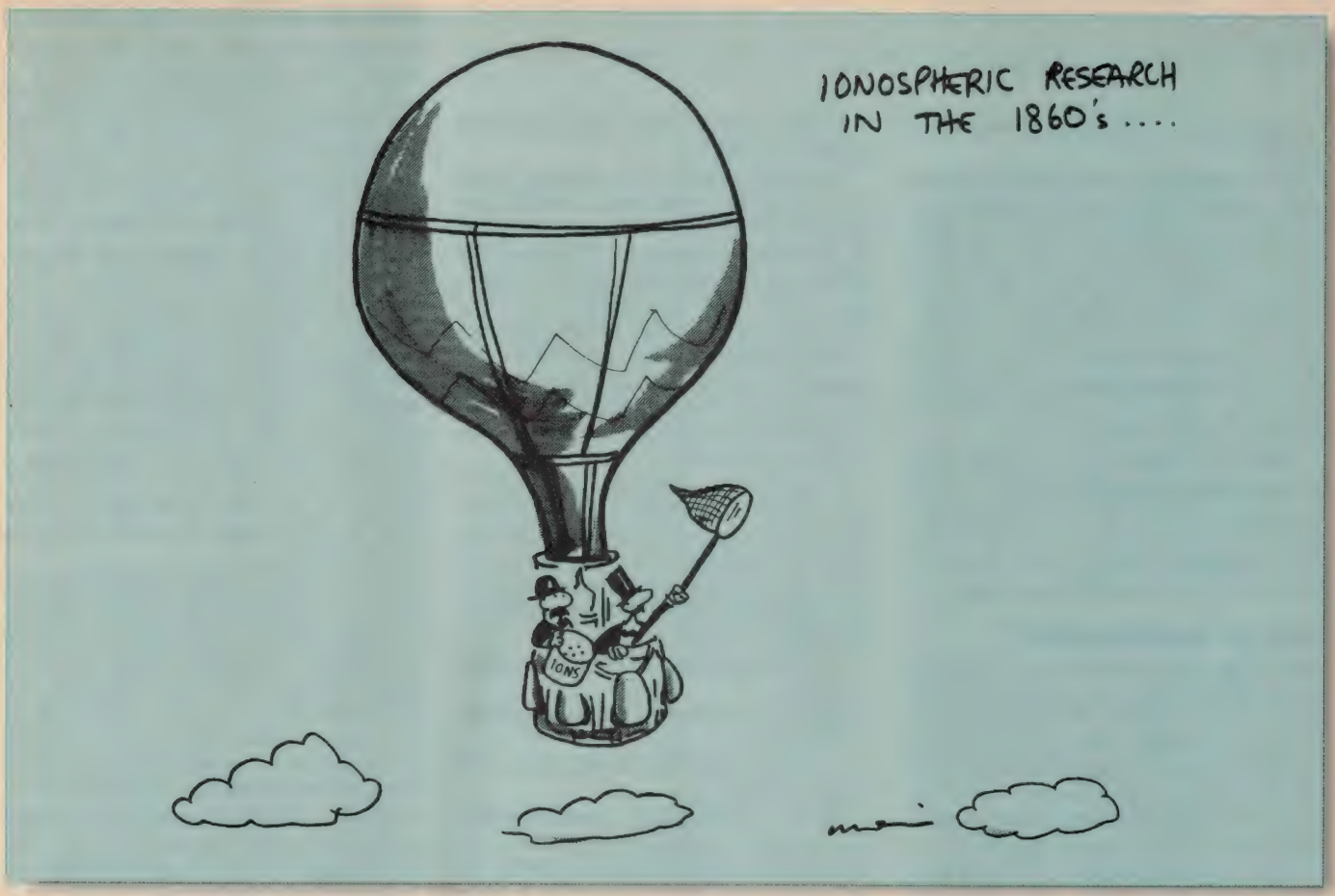
One big difficulty with using the transmitter was that it ran in the middle of the broadcast band, at a fixed frequency of just over 1.5MHz. As this single transmitter was probably equal in power to the total of all commercial broadcast band transmitters in Australia, there were naturally a few restrictions on transmitting. The main transmitter could only be run from midnight to dawn, but as a tradeoff we had exclusive use of a narrow range of broadcast frequencies during the early dawn hours.

Now you may wonder why megawatt transmitters are needed to research the ionosphere. As you probably know the ionosphere is a layer around the earth between about 50 and 800km up, that contains sufficient free electrons and ions to affect radio waves.

When a radio wave travels through the ionosphere, it sets the electrons into oscillation, and these oscillations are dampened by collisions between electrons and gas molecules. Above about 100km the collisions are sufficiently infrequent that for most purposes their effects can be ignored. This is called the E and F ionosphere region. In these regions it is possible to simply determine the ionosphere characteristics by obtaining echoes from a range of frequencies. This is done from the ground or satellites, with a device called an ionosonde sounder.

But below about 100km the atmosphere effects things. This is the D region. Here the collision frequency of electrons with gas molecules becomes important. This makes the region much harder to study. One of the few available techniques is to send high powered pulses at between 1.5 and about 6MHz into the D region. This energy excites electrons in the D region. By studying how long this excited area takes to return to normal it is possible to understand what is occurring.

The UNE transmitter was used to send megawatt pulses at just over 1.5MHz into the D region. Each pulse accelerated electrons, which then cooled as they collided with the tenuous gases in the ionosphere. By sending very short probing pulses from smaller transmitters through the heated area and studying the echoes, it was possible to determine how slowly the pulse decayed at various heights. For example it was possible to analyse the effect of sunrise on the D region and the resulting major changes in radio propagation.



The smaller probing transmitters used to investigate the decay of the main transmitter pulses were 10 - 20kW transmitters operating at about 2.2MHz. These were not originally crystal locked, and on more than one occasion there were friendly calls from the PMG's Department about an 'unknown transmitter' wandering into the 2.182MHz marine distress frequency and setting off alarms on ships all along Eastern Australia.

Thus HAARP is not exceptionally powerful by the standards of ionospheric research. HAARP will ultimately run at about 3.5 megawatts and this is not much higher in power than equipment we had in Universities here in Australia 25 years ago.

It is possible to guess at how HAARP will be used without resorting to 'Death Star' headlines.

Locating HAARP in Alaska is very interesting. It is very important scientifically, as in those regions one can see the consequences of the interaction of the upper atmosphere with energetic particles ejected from the sun (the 'solar wind') and the earth's magnetic field. Part of the energy received from the sun in that manner leads to the production of the Aurora Borealis. Part of the energy also goes into large electrical currents flowing in the upper atmosphere at an altitude of about 100km. These currents are strong enough and impulsive enough to disturb the magnetic field near the ground and to induce ground currents that can be sufficiently intense to seriously disrupt ground electrical networks. Currents can exceed a million amps, spread across a belt 100km wide. The upper atmosphere at the poles is a very interesting place.

The one original part of the HAARP research program is to investigate if this current can be modulated at 30 kilohertz or less, to generate a small low frequency signal. It appears theoretically possible to heat electrons in part of the ionosphere to change the upper atmosphere currents by about one part in a million. This would be enough to generate a measurable signal on the ground.

At present the US Navy uses two low frequency transmitters in the US to cover the world. Perhaps this is a simpler way to generate Extremely Low Frequency (ELF) signals. For more information see the Internet site www.haarp.alaska.edu.

Other claims made

Tom's article mentioned that 'according to people who have sighted HAARP internal documents, it's planned to expand the project until it can produce a beam of 1700MW'. I find this highly unlikely, for quite a number of reasons.

Unfortunately Tom does not state where this information came from. There may be a simpler explanation, as 1700MW would seem to be about the theoretical isotropic power of the HAARP transmitter. When discussing heating and other effects, sometimes the transmitter power level is quoted as if the transmitter radiated equally in all directions. A torch beam compared to a point source of light illuminating the inside of a globe uniformly would be a visual analogy. The ultimate HAARP transmitter power of 3.5 megawatts with the antenna gain of about 500 (say 25-30dB) would be equivalent to an isotropic transmitter of 1700MW. Possibly the theoretical isotropic power level has been given in some document and someone has confused it with the transmitted beam power.

The other claims by Tom in the article need rather more backup before they could be seriously considered. I like Tom's writing style, but he needs to stop writing speculation as if it was fact. I have always believed that the more unusual and extreme the claim the greater the need for evidence. But Tom does not produce any evidence.

For example he comments on a Russian transmitter (Woodpecker) that 'many scientists feel that the woodpecker's real purpose was to experiment with modifying human brain function'. Now this is a really major thing to claim without any supporting sources. He needs to start naming his sources if he wants to be taken seriously rather than comments such as 'other documents come from sources we'd rather not know about'.

I hope you find the above comments of interest.

I did indeed, Mr Cameron, and I imagine other readers will as well. Thanks for describing the ionospheric research setup near Armidale in the early 1970s, and helping to put the HAARP project into clearer perspective. Your point that 'solar wind' particles from the sun can already produce currents of millions of amps certainly suggests that the excitation produced by HAARP is still rather short of the level needed to destroy the planet, doesn't it?

I take your point that our 'Death Star' wording in the heading and on the cover was probably a bit 'over the top', but we niche-market magazines tend to get 'lost in the noise' nowadays unless we attract attention. Hopefully the wording did that, at least.

TBC, or synchroniser?

Moving on, our second letter is in response to the review I did in the April issue, of the Video Tech VMX400 Video Mixer and Timebase Corrector. Our correspondent is Mr Gary Yates, of Frenchs Forest in NSW, and although he doesn't say as much I suspect he's actually the father of our frequent contributor Darren Yates. Basically he's writing to question the use of the term Time Base Corrector, by both Video Tech and myself, in connection with the circuitry in devices like the VMX400:

Forgive the familiarity, but I feel I know you. I've been reading EA/RTV&H since 1958 and was initiated into electronics via its excellent articles and construction projects.

I've just read the April 98 edition (yes, I'm a bit behind) and came across your review of the Video Tech VMX400 vision mixer. From the article I got the impression this unit is meant to be used with domestic VCRs. The following letter is based on this assumption.

Liberally sprinkled through the review are the capital letters TBC, which of course stand for Time Base Corrector. I would like to throw a cat amongst the pigeons and say, from the description of the device, it is not a TBC but a Video Synchroniser (VS). These are two different devices, as follows:

1. *A VS is a freestanding device and a TBC is not.*
2. *A VS requires a 625 TV line memory. A TBC only needs a 20 TV line memory.*
3. *A TBC outputs a fault-free video signal, while a VS does not.*

Just to recap, a little bit of tape recorder theory. Any tape recorder, be it video or audio, if it is to work well, must maintain its tape speed accurately. Usually tape machines have two speed problems:

1. *Dynamic speed variation, called 'Wow & Flutter' on audio tape machines.*
2. *Static speed offset error, which causes tone pitch shift on audio machines.*

A TBC works to correct these in video machines as follows.

The usual method to fix dynamic speed variation on the video output of a VCR is to feed the VCR output into a memory unit, with the input clock locked to the VCR output and clock it out at a fixed rate locked to a reference signal input. The dynamic errors in most video machines are usually less than +/-10 TV lines and hence only a 20 TV line memory is necessary. The output is effectively tapped halfway down the memory so that it can increase or decrease the signal delay by up to 10 TV lines.

As you can probably guess, a small 20 TV line memory is not going to handle a static speed error, which will need an ever increasing or decreasing time delay correction. To solve this problem a DC control signal is derived from the 20 TV line memory addressing circuitry, so that:

1. *At 10 TV line delay the DC output voltage is zero.*
2. *At 20 TV line delay the DC output voltage is positive.*
3. *At zero TV line delay the DC output voltage is negative.*

The DC output signal swings smoothly between these limits depending on the average time delay. This DC signal is fed back to the capstan speed servo in the VCR, to speed up or slow down the tape to remove the static speed offset and keep the average speed of the VCR video output signal exactly matching the reference signal fed into the TBC. There will thus be no time errors on the video output of the TBC.

Now let's turn to the video synchroniser. A VS relies on the fact that the video signal virtually repeats itself every 625 TV lines.

Domestic VCRs do not have any external inputs to their capstan servo circuitry. Due to the relaxed tolerances of these servos, it's a good bet they will also have a static speed error to a certain degree and this will get worse as the VCR ages.

Let us assume that the VCR speed is a little fast (a positive static speed offset) and, at this point in time, the start of line 1 of the VCR video output is coincident with the same point on the reference signal fed to the other input of the VS.

At the end of line 1 the VCR signal synch pulse will occur before the synch pulse of the reference signal. (Because the VCR is running fast, the line synch pulse frequency will be higher and the time between the synch pulses will be shorter.) The 625 TV line memory will add a slight delay to the VCR video signal, to make sure its synch pulse is coincident with the reference sync pulse.

At the end of line 2 the memory will add a little more delay again to get both the second synch pulses to line up, and so on right through the 625 TV lines in the frame. (Of course the memory is actually adding tiny amounts of delay right through each line; not just one big jump at the end of each line.)

So you can see the memory is adding more and more delay, until it hits the end stop and there is no more memory left. The VS overcomes this problem by simply snapping back to zero delay and starting all over again. This gives an apparent synchronous output, BUT what actually happened was that the memory dropped a whole frame of video. Discarded it. Threw it away. Never to be seen again. What does this really mean?

Well, if the VCR is running fast, the picture will jump forward (skip a frame) every so often — or if the VCR is running slow, the picture will jump back (repeat a frame) every so often. These jumps will give you a rhythmically jerky picture. How often depends on how far out the speed of your VCR is. The greater the speed error, the more often the jerk.

Some advanced video synchronisers get around this problem by having a Rolling Frameline Update system. Instead of adding or skipping one complete frame every 100 frames (for example), they just add or skip one hundredth of a frame (6.25 TV lines) every frame. This produces a different fault on the picture. A scene change can occur partway down the frame. The previous scene would be in the top part of the frame and the next scene would be in the lower part. The picture update line will cycle through the frame continuously, but you will only see it when the scene changes.

A TBC does not produce either of the above faults and is, in my mind, the better unit. Unfortunatly, it cannot work with domestic VCRs.

It would appear that the Video Tech VMX400 is not a TBC and therefore there is the chance it will produce picture errors if your domestic VCR has a static speed error.

Thanks indeed for that explanation and clarification, Gary. I confess I did half-remember the correct terminology and the distinction between a TBC and a video synchroniser when I was writing the review, but used the term 'TBC' because Video Tech and the other manufacturers seem to use it.

I suspect you're quite correct that the devices are really video synchronisers, and would therefore be capable of producing the kind of picture errors you describe. All I can say, though, is that during my testing of the VMX400 — with a couple of different domestic VCRs, one quite elderly — I really didn't notice any errors of this type.

I had assumed that the memory in the VMX400 was organised like a big FIFO buffer, where the addressing simply goes 'around and around', and both the writing and reading were on a line-by-line basis so there wouldn't be any sudden jumps on the output. Are you sure they couldn't be doing things along these lines?

But that's about all we have space for this month. Cheers! ❖

New Books

Cosmic ray saga

COSMIC BULLETS, by Roger Clay and Bruce Dawson. Published by Allen & Unwin, 1997. Soft covers, 198 x 131mm, 194 pages. ISBN 1-86448-204-4. RRP $16.95.

Another title in the Allen & Unwin 'Frontiers of Science' series edited by Professor Paul Davies of the University of Adelaide, designed to describe current research and developments in selected topics, in an accessible way. The authors of this volume are also at the Uni of Adelaide, as research physicists, and are experts in cosmic ray research.

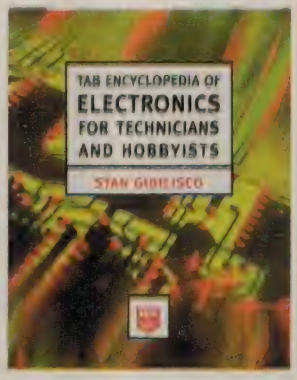
In *Cosmic Bullets* they explain that despite a fair amount of work over the last century or so investigating cosmic rays, there's still a lot about them that isn't properly understood — like where many of them come from, and the exact mechanisms whereby such high energy particles are created in the first place. The aim here is to give the reader a good understanding of what has been achieved to date in studying these intriguing ultra-high energy particles, what they've told us so far, and what the challenges are for current and future research.

For anyone with a reasonable background in science (which probably includes most readers of *EA*, I imagine), it should make very interesting and accessible reading. The authors start with a rundown of basic particle physics, and follow this up with a narrative of what has been found over the last century. This then gives you a good foundation to understand and appreciate their description of current research projects and where they're heading.

As cosmic ray research is closely allied with electronics, I imagine many of our readers will find it as interesting as I did. There's both a glossary and a bibliography at the end, by the way.

The review copy came from Allen & Unwin, of 9 Atchison Street, St Leonards 2065. (J.R.)

Learning electronics



TAB ENCYCLOPEDIA FOR TECHNICIANS AND HOBBYISTS, by Stan Gibilsco. Published by Tab Books, 1997. Hard cover, 194 x 242mm, 961 pages. ISBN 0-07-024190-2. RRP $150.

This book is the largest I've seen from this prolific author, which helps explain its rather high price tag. It claims to cover virtually every aspect of hobby and consumer electronics, and it certainly covers a lot of ground. There are some formulae given, but for the most part things are kept relatively simple. To me, the book could be improved with more tables, equations and circuits, and less text.

Being an encyclopedia, all entries are in alphabetical order. However, there's also an index which helps you find subtopics within an entry. The main problem is what it leaves out. The content is very general, and broadly covers most aspects of electronics, including a few that seem irrelevant. For example, nearly a page is devoted to the term 'Luddite'...

As you'd expect, computers and their peripherals get a lot of coverage, as does radio, television and other consumer appliances. The book is ideal for browsing, and would certainly give a non-technical person or a beginner to electronics a good idea of electronic equipment and appliances. But it is *not* a reference book for technicians.

The review copy came from McGraw-Hill, PO Box 239, Roseville 2069. (P.P.) ❖

Serviceman

The customer who'd imported what was very nearly an expensive boat anchor!

Paying to have a piece of very expensive second-hand electronics equipment shipped from the other side of the world can be pretty risky — especially when the equipment concerned is a high-end valve hifi amplifier, as one of this month's stories illustrates. We also have the tale of tracking down weird intermittent faults in an ageing germanium-era electronic organ...

This month we open the column with a story from a familiar contributor over the Tasman, Peter Lankshear. You'll no doubt recall that Peter conducted our Vintage Radio column for many years and from that you might deduct (correctly) that he is a 'full bottle' on valve technology. This story continues his association with the old 'bottles with lights in them', although this equipment is more up-market than the old five-valve mantels he used to write about.

Here's what Peter has to say...

This story is unusual in that it describes a repair job that started in England and was completed 20,000km away, in New Zealand. It also made me aware of the questionable ethics of the service persons concerned.

An unforeseen and remarkable development in the ever-changing world of electronics has been the widespread enthusiasm displayed by a significant number of audiophiles for perpetuating the use of valve audio amplifiers. The outcome has been the manufacture of expensive and technically obsolete equipment and at times an acceptance of what are, in fact, reduced performance standards.

A related group of enthusiasts has gone to great lengths to search out and have refurbished, surviving classic high quality amplifiers such as the Williamson, Leak and Quad. Unlike some present day valve counterparts, these do have high performance figures.

During the 1960s, one of the last of these classics to appear was the Radford, a 'no compromise' example of the best of valve technology, with a specification that even by today's standards is impressive. Capable of a genuine 100 watts RMS per channel at 0.1% distortion, its two output stages each used a pair of ultralinear connected KT88 tetrodes.

The phase inverter driver stages were long-tailed pairs of frame grid EF184 TV pentodes and the input stages used cascode ECC88 double triodes. The complete stereo amplifier is quite large, massive and very heavy. To lift one entails first taking a deep breath and then risking a hernia!

One local enthusiast was so keen to obtain one of these monsters that he arranged the purchase of one in England and had it air freighted to New Zealand. What his freight bill totalled, I hate to think.

By all accounts, the amplifier had been used in a pub. That it was working at all is more a tribute to Radford quality than to its environment, but the new owner soon discovered that whilst one channel seemed to be operating well enough, the other was not. A new set of very expensive valves did not help, and it was then that my aid was sought. I agreed to look it over and the monster was duly heaved onto my workbench.

Upended and with the bottom cover plate removed, some serious modifications were immediately apparent. The output stage of the faulty channel had been altered to more or less straight tetrode operation, with reduced screen and altered bias voltages.

This suggested that a misguided attempt had been made to change the operating conditions to class AB2 — not possible with conventional driver coupling. This roused some deep suspicions. It is not unknown for

The Radford STA-25 valve power amp, 'little brother' of the model discussed in Peter Lankshear's story.

a circuit to be modified in a vain attempt to cure a fault, but such desperate measures in this type of equipment never work.

At this stage, with no data or circuit available, I was not prepared to do any more until some information could be obtained.

The required manual eventually arrived, and I was able to check all components likely to have deteriorated, and restore the circuit to its original state. Most resistors and capacitors were mounted on printed circuit component boards with numerous connections to the valve sockets and power supplies.

A methodical progress through the amplifier revealed only a few components out of close specification, and most of the work entailed tidying the wiring, replacing butchered terminals and sockets and correcting the modifications. Because I had found no really faulty capacitors or resistors, I was had an open mind as to whether or not the crippled channel would now work.

One hand in pocket...

With the amplifier switched on I took a detailed set of meter readings and found that the voltages of both channels were close to specification. (With 600 volts of HT floating around the chassis, I made sure one hand was firmly in my pocket!) So far so good. It was now time to listen to the audio quality.

To connect a 100-watt amplifier directly into a workshop speaker is a bit pointless and potentially damaging, so I fitted up an 8Ω high wattage load resistor with a small sample of the output for the speaker. With an FM tuner connected and the gain wound well up, both channels produced what seemed to be plenty of high quality output. Certainly, the horrible sound from the modified stage had gone. I sat back, enjoyed the music and speculated as to the real reason for the modifications.

There was however still a lingering doubt, so I dusted off the oscilloscope, an audio oscillator and a meter known to be accurate at audio frequencies and set about measuring the output. The good channel produced a fraction over the required 28.3 volts into 8 ohms, but the other managed only half of this figure, equal to 25 watts. This confirmed (a) the futility of using ears to measure audio levels, and (b) that there was still a fault.

What was left to go wrong? It had to be the output transformer. Swapping the connections over to the good channel confirmed that there was indeed one faulty transformer. It was the worst possible fault — and the most expensive item by far, assuming a spare could be found, which was unlikely.

Here was the real reason for the modifications. Someone had probably discovered the faulty transformer and had attempted to correct the lack of output by altering the output stage. And when this was unsuccessful, the owner must have decided to quit the amplifier. I couldn't help but wonder if it would have been exported to New Zealand had it been in good condition...

A 100W wide range output transformer is a massive beast. It has about twice the amount of iron required for a power transformer of the same power rating and is at least twice the size of the mains transformer for a large valve receiver. But the real problem is the very specialised sectional winding methods. The Radford transformer has four secondary and four primary windings and each primary section is tapped for the ultra linear screen connections.

Furthermore, two of the primaries are wound in the reverse direction and as each pair is connected in parallel, the number of turns on each section has to be exactly the same (in this instance 1000 turns). If the transformer could not be repaired or replaced, there would be an unhappy owner of a very expensive boat anchor.

Valve amplifier enthusiasts are purists, and only a Radford transformer would have really been acceptable.

There was one possible solution. New Zealand Vintage Radio Society members are fortunate in that one of their number is a REAL transformer rewinding expert. He has been at the game for over 60 years and will tackle anything, invariably turning out a superb job with better craftsmanship and materials than the original.

He also has an extensive database of transformer specifications and when he is confronted with a new transformer, his first action is to meticulously unwind it, noting the exact number of turns and the configuration. But would he take on the complex Radford? A phone call ascertained that he would!

The beautifully rewound transformer duly arrived back and was soon in operation with full output now available on both channels. One very happy owner was able at long last to enjoy his music, and I was able to reflect on the perils and expenses of repairing old amplifiers, and the inadvisability of importing used equipment.

However, there was one last sting in the Radford's tail. A few weeks later the owner called to say that he now had a small annoyance. He listened in rapture to the Radford daily, but about once a week it would briefly produce a small frying sound that would disappear as soon as the occupant of one particular EF184 socket was touched.

He had tried several new valves to no avail. After all we had gone through, to now have an intermittent fault was as welcome as the proverbial hole in the head!

There was nothing for it but to invert the chassis on the workbench and leave it running. Nothing happened for a few days. I felt it was a dry joint of some sort and eventually resorted to prodding around. Here I found that one section of the PC board was at times microphonic.

Out came the board — again — but a close inspection with a magnifying glass showed nothing unusual. I then unsoldered one of the joints in the troublesome area, to discover that the resistor lead was quite black under the solder.

This had to be the problem and although externally they appeared OK, several similar joints were found. To make completely sure I unsoldered all the component leads, cleaned and then carefully resoldered them. This was a year ago and the Radford has not given any further trouble.

If a conclusion can be drawn from this adventure, it is that all equipment has a finite life — which can be extended, but often with considerable and uneconomic effort. I believe it also shows why it is unwise to import used equipment without some safeguards.

So how about that? I wonder what would have happened if the Transformer Whizz had been unable or unwilling to tackle the rewinding job. As you say, Peter, it would have been a very expensive boat anchor...

Of course, we don't know the history of the amplifier. The modifications may have been authorised by an owner who was quite satisfied with the compromised performance. I've struck people who are happy to have quite expensive gear patched up rather than properly repaired.

The argument often is that they aren't sufficiently interested in high quality to warrant the extra cost of full repairs. And I suppose the attitude is quite legitimate. But then, why did they go to the expense of buying costly gear in the first place, if quality wasn't important? Did they only buy the brand name?

The practice of 'rough patching' only becomes unethical when the equipment is sold off and the new owner is not told of the service history. It's not often possible to conduct full output trials on high-end audio products, and low level tests can be quite misleading. I imagine that's what has happened in this story.

Thanks for that tale, Peter, and we are looking forward to your next contribution, whenever it may be.

Serviceman

Hammond organ

And now for a story from another frequent contributor. He is Robert Abel, from Condobolin in NSW. This time Robert has written about a subject that seems to be much more common these days than in the past. Here's what he has to say...

After the last couple of jobs which were mostly mechanical, this one was a genuine electronics fault. But after a reel to reel tape recorder and a VCR, what else could I get involved with but an electric organ?

The organ in question is a Hammond, with two 44-key manuals and 13 foot pedals, and I quote from the service notes: 'The Upper Manual contains three sixteen-foot voices, Flute, String and Reed. The Lower Manual has two 8' stops, Tibia and Cello. With the addition of Reverb, Manual Balance, Vibrato I and II, and Pedal Accent, the VS100 is a simple but functional organ'.

Note that VS100! This particular organ is a V222, an earlier model with exactly the same features but using discrete transistors (germanium 2SB56s), where the VS100 uses a simple IC (LD3061) to do the same jobs.

There is a 'Generator' board containing 12 oscillators (the top octave) ranging from 554Hz to 1047Hz and these, of course, run continuously when the organ is switched on. Other notes are derived from a series of dividers on three separate boards, controlled from the key switches on the upper and lower manuals and the foot pedals. The various 'voices' are controlled by rocker switches alongside the Upper Manual.

I found that the organ had been purchased as a demo model in 1975, which also happens to be the year I decided to sit out my retirement(?) in this town.

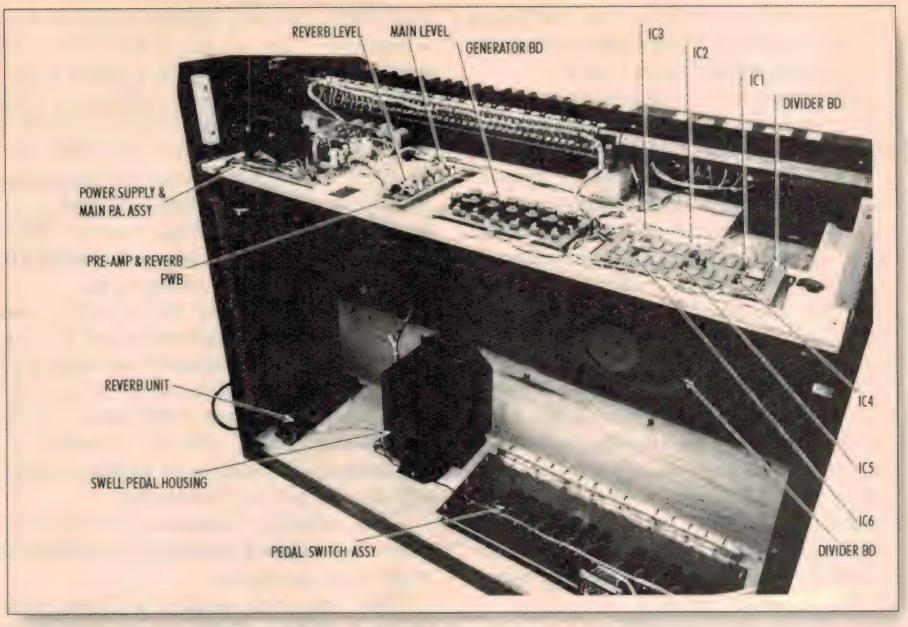
I did not become affiliated with the body which owned the organ until 1977, and it must have been shortly after that when I was persuaded (compulsorily volunteered?) to restore some key contacts which had become rather uncertain and scratchy.

Over the years since then, another peculiar fault developed, manifested at first by an inability to obtain any output from the first foot pedal (it should sound bass at around 66Hz).

After the organ had been switched on for a while, brief bursts of bass would erupt periodically (with the pedal held down) until eventually the output was continuous again. And so, for a time the trouble was not regarded as serious enough to warrant expert attention.

The 'warm-up' periods gradually became longer over time and then the fifth note on both manuals became affected, roughly doubling the pitch when the pedal was inoperative. So it became the practice to turn on the organ about 4pm, to enable normal use in the evening.

This might have continued indefinitely, except that this year, with the annual installation looming, the organist reported several notes inoperable, necessitating a repeat of my previous job on the key contacts.



Inside a Hammond VS100 electronic organ, showing the main system modules. The V222 is apparently very similar.

So, there I was, once again cleaning and adjusting the leaf contacts and allowing my curiosity to ponder the reason for the bad behaviour of the first pedal et al.

I took some voltage readings along the (very dusty) sides of the nearest boardful of germanium devices (2SB56's) and found that the usual result was in the region of 12.5 volts, until suddenly I found a reading which refused to hold still but seemed to 'toggle' between about 5 and 16-19 volts.

This had to be the circuit I was seeking and to confirm it, after a session with vacuum cleaner and a soft paintbrush, I unsoldered leads variously numbered U1, L1, and P1. These were the leads coming from the faulty notes on the Upper and Lower manuals, and the first pedal key.

It was not an easy matter to inspect the underside of the board because of the restraint imposed by the wiring, but I located a transistor which had to be part of that circuit and took it out for testing. It was perfectly OK and fitting a replacement had no effect at all; the voltage continued to toggle as before.

That's when I noticed that there were two 25B56s in this circuit and of course the second one WAS faulty, with very high leakage current. The toggling effect vanished with its removal, and after fitting a replacement a check showed that all three notes were playing normally again.

I can't understand why the high leakage current should cause the device to toggle, but I assume that the fact of toggling would perhaps have racked up a charge on one of the associated capacitors, sufficiently to stabilise conditions in the circuit for a time and so produce a normal note until the charge dissipated.

But this does not explain why — after an hour or two — normal operation would return! No doubt one or more of the organ service people who read this will put me right about all this...

I wondered then about the tuning of the main oscillators and contacted a colleague who, although older even than myself, still runs a healthy repair shop and who I knew had operated on a number of Hammond organs and could be relied on to have the necessary information on frequencies, etc.

Armed with my new knowledge and with trusty 1GHz Counter under arm, I took our organist over for a trial run. I am quite fond of music — though totally incapable of producing any myself — but I wasn't sure whether to be pleased or just a little disappointed when the expert declared the tuning perfect and all I needed to do was put the covers back on! Oh, well, you win some...

That was an interesting interlude, Robert. As you said earlier, it's a very electronic yarn and, on reflection, one that has meaning even outside the field of Hammond organs.

There are still a lot of products about that use old germanium transistors and your description of unusual behaviour in those devices might help to solve problems for other servicemen.

By an odd coincidence, I was sorting some old manuals yesterday and came across a service manual for the Hammond model VS100, along with the installation manuals for a Leslie model 130 speaker and the 7830 control connector kit. I don't know how I came to have them in my collection, but someone locally must have been working on one of these very popular organs.

Thanks for that story, Robert. We'll look forward to more unusual tales from your rather active retirement.

And that's it for this month. There'll be more next time, if the fates are willing. ❖

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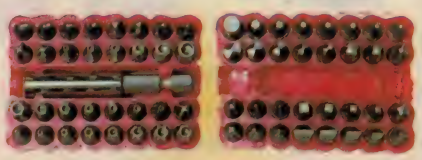

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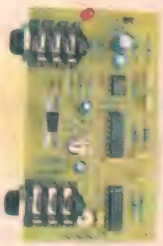

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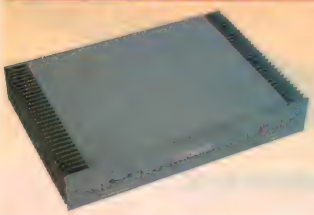

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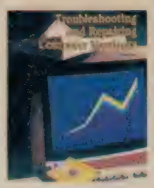

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Circuit & Design Ideas

Interesting original circuit ideas and design tips from readers. While this material has been checked as far as possible for feasibility, the circuits have not been built and tested by us. We therefore cannot accept responsibility, enter into correspondence or provide any further information.

Simple mod improves Cable Break Finder

The Cable Break Finder published in February 1998 is designed to test faulty cables, but what it can't tell you is whether the cable is shorted or OK. This simple modification will let you test good cables, and adds an extra level of cable fault finding to the Break Finder.

A good cable can be tested if one end is removed from the Break Finder, and a small capacitor fitted in its place. This is a bit inconvenient, but a momentary DPDT pushbutton can disconnect the sockets on one side, and substitute a 1nF trimmer instead. If a balance can be achieved with the button pressed (and a cable attached to the other side), then the cable is OK; if not, then the cable is shorted. To balance the extra switch capacitance, a trimmer can be fitted to the other side and be adjusted for 50% balance without any cables inserted.

With this modification, the sequence for testing a cable would be as follows:

Try to balance for a break in the usual manner. If this is not achieved, then balance for the total cable by unplugging the cable from the switched side of the tester and pressing the button.

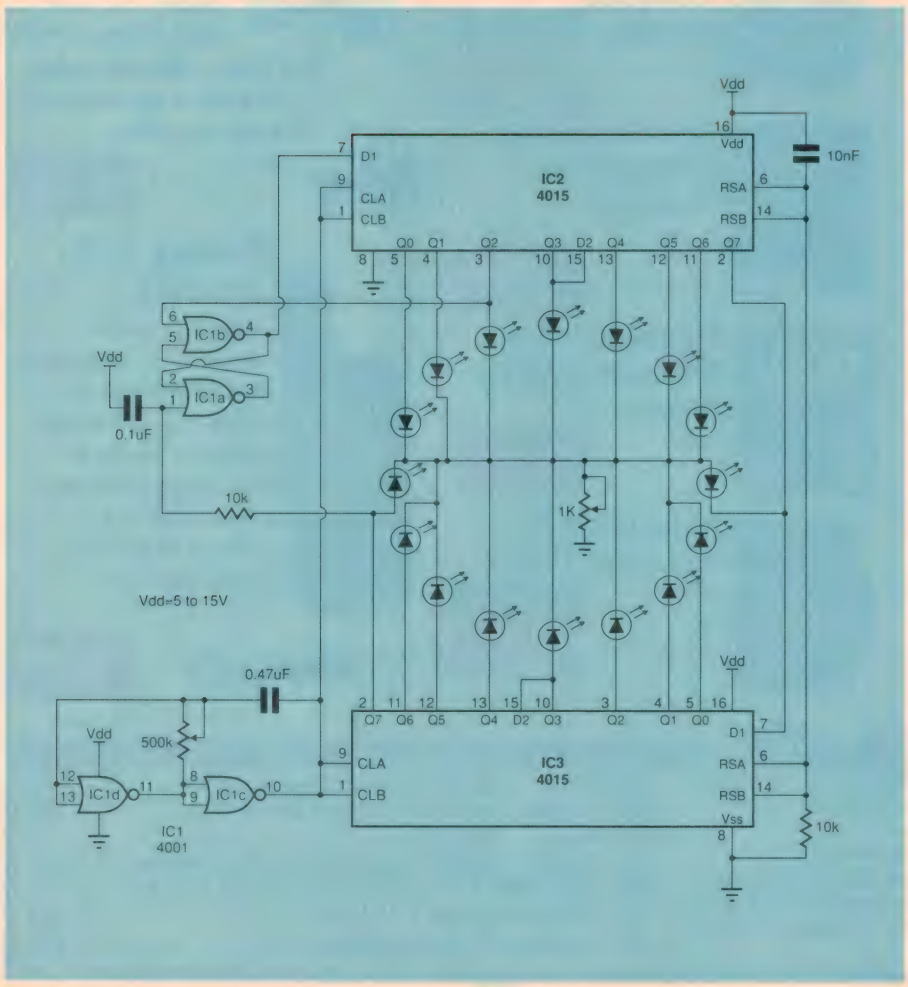
If a balance still can't be achieved, then the cable is most likely shorted and a low-ohms meter would determine the likely break point by comparison of both ends.

Note: Cables in the sound industry have capacitances of around 90pF to shield and 60pF between conductors per metre length, so a 1nF (1000pF) trimmer could easily balance cables between 1M and 100M in length.

Victor Erdstein
Highett, Vic. **$30**

Novel running light display

Running lights or 'chasers' are nothing new, but this one is simple and versatile: The number of LEDs in a group can be selected, as can the number of spaces between them as the pattern repeats. I used this circuit to create a pendulum for a mantle clock by using 16 dual-colour LEDs arranged in an arc and with four shift registers. The pendulum (a group of three 'on' LEDs) swings in green colour from left to right and back again in red.



The circuit shown consists of two dual shift registers (IC2 and IC3) and a quad NOR gate. IC1a and b are wired as an RS flip-flop. It is set at switch on via the 0.1uF capacitor at pin 1, forcing its output (pin 4) high. Simultaneously the registers are reset via the 10nF/10k network at pins 6 and 14 on both registers. The remaining gates IC1c and d form an oscillator with variable frequency via the 500k pot.

On the rising edge of each clock pulse, the data at pin 7 is loaded and shifted from left to right (CW). The reset pin of IC1b connects to Q2 (the third output of IC2), so when this goes high it resets the flip-flop, pulling the data input low. The three LEDs now lit 'shift around' until the last output goes high (Q3 of IC3 high), which sets the flip-flop again and the cycle repeats.

The pattern produced resembles a group of lights chasing around the circle continuously. The circuit can be expanded by adding one or more shift registers in series, where one of the last outputs of the chain is connected back to the 'set' input of the FF.

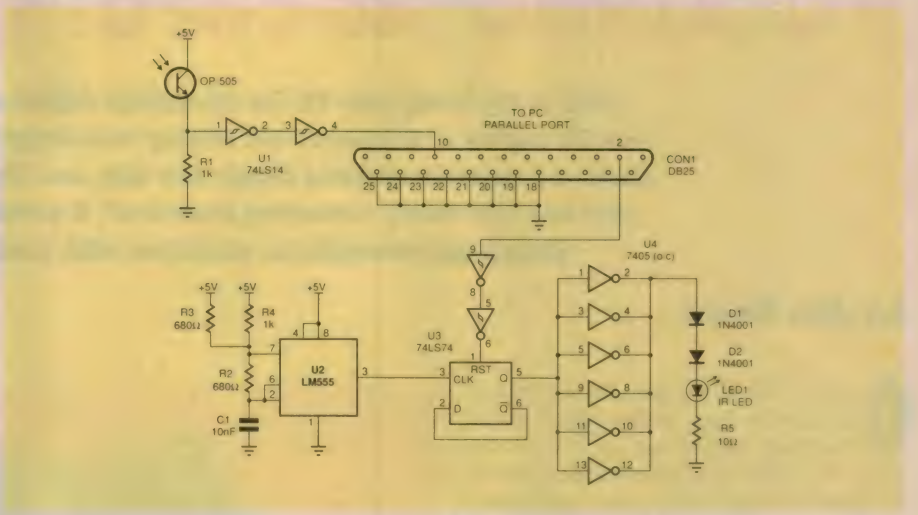
Programming is easy, for example: required string of 20 LEDs and group of five LEDs chasing, solution: three series-connected shift registers are needed, the reset line connects to the fifth output in the chain, the fourth output (the twentieth in the chain) of the third register connects back to the 'set' input of the flip-flop.

Manfred Schmidt
Edgewater, WA **$30**

As an added incentive for readers to contribute interesting ideas to this column, the idea we judge most interesting each month now wins its contributor an exciting prize, in addition to the usual fee. The prize is a complete closed circuit TV system, comprising a 5" B&W video monitor, CCD video camera with stand, power supply and cabling. This system comes from our sponsor Allthings Sales & Services, and is valued at $369.00!

Win our 'IDEA OF THE MONTH' Prize!

Universal IR Controller for a PC



This simple circuit allows you to record any IR remote control signal on your PC, and then play it back. This is particularly useful if you want to control appliances such as TVs, VCRs, CD players etc., from your computer. The device simply connects to the parallel port of your PC, and you can also use this circuit to analyze the waveform from any IR remote control.

The circuit consists of two parts. The first part is the IR receiver, made up with an OP-505 IR photo transistor. This signal is buffered and squared up by the Schmitt trigger inverters (74HC14). The output of the second inverter goes directly to the Acknowledge line (pin 10) of the parallel port. The software polls this line in the recording mode and stores the incoming data sequence.

The transmitter consists of a clock generator (555) set to run at 80kHz, connected to a 74LS74 D-type flip-flop. The flip-flop divides the clock signal by two, giving a precise 50-50 duty cycle on a 40kHz signal. This is then used as a carrier for the transmitter section of the circuit. In playback mode the software turns the D0 line of the parallel port on and off at the same rate that it recorded the signal, which is used as a gate signal for the 40kHz carrier. The gate action is achieved by controlling the reset input of the D flip-flop. If the reset line is low, then the Q output is also held low.

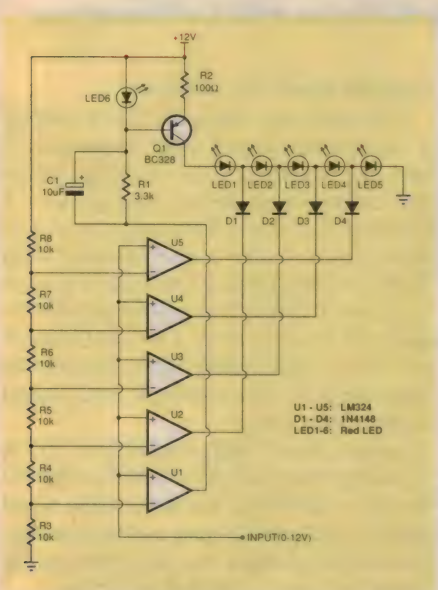
This gated signal is then used to drive the IR LED via the driver section. The IR LED driver section consists of a 7405 hex open-collector buffer. All the outputs of the 7405 are tied together to give enough current to drive the IR LED. The two 1N4001 diodes are used to step down the voltage to around 3V for the IR LED. This may seem to be a bit of overkill, but it does mean that you can drive several IR LED's simultaneously. The 555's frequency can be adjusted for remote controls whose carrier frequency varies from the standard 40kHz.

The record/playback software can be obtained free of charge from **http://www.geocities.com/SiliconValley/Lakes/7156**, and it allows you to record/playback and view just about any IR remote control signal. The real fun begins when you write your own software to control your house. For example, a program can be easily written that automatically programs the clock on your VCR, TV and anything else.

George Katz
Manly Vale, NSW **$40** ❖

THIS MONTH'S WINNER!

Low current bar-graph display



This bar-graph display achieves low current consumption by switching the LEDs in series, as opposed to the conventional parallel arrangement.

Resistors R3 to R8 set the threshold voltages in 2V increments, from 2 to 10 volts. These resistors can obviously be changed in value to suit the desired application. As the input value exceeds 2V, U1's output swings low, turning on the constant current source based around Q1. Because the outputs of U2 to U5 are still low at this point, only LED1 will light.

As the input voltage increases from 4V to 12V, U2 to U5 will switch on consecutively, allowing current to flow through LED2 to LED5 respectively. Due to the constant current source, only 10mA will flow through the LEDs whether only one is on, or all of them are on.

If the input voltage is below the minimum threshold, U1 will switch to +12V, turning off LED1. The total current consumption is around 13mA when the LEDs are on, otherwise it falls to almost zero.

Wayne Robjent
Tuart Hill, WA **$30**

'Front End' for PC Audio Recording

Like to try using your PC for CD-quality digital audio recording? Or for making your own CD copies of treasured old analog recordings? Most modern PCs and their sound cards are capable of doing things like this, but the job will be a lot easier if you build and use this handy 'recording front end'. It provides stereo preamps for a magnetic pickup and microphone, combined with basic mixing and tone control facilities.

by Jim Rowe

Only a few years ago, the equipment needed for high quality digital audio recording seemed way out of reach for most of us. High quality professional analog to digital converters had equally 'professional' price tags, and only dedicated professionals could justify the cost of hard disk drives with the many hundreds of megabytes of storage needed — because with CD-quality stereo, you need over 10MB per minute.

As for recording your own CDs, that seemed even more in the realm of fantasy...

Happily, though, that's all changed. Most modern PCs are fitted with sound cards whose A/D converters are capable of surprisingly good quality, and with hard disks of multi-gigabyte capacity. Even with the steadily expanding size of modern software ('bloatware'), there's still likely to be enough space to store the tracks for at least one CD's worth of audio...

When it comes to CD recording, you can also get CD-R 'burner' drives which are capable of recording very acceptable (and fully compatible) DIY audio CDs, plus a variety of easy-to-use software to help you perform audio recording to hard disk, edit your digital audio files and then write them to a CD. So now, almost anyone with a reasonably modern PC can use it as the basis for a high quality digital audio recording system — and for a lower outlay than you probably expect.

One very attractive use for such a system is for making personal CD copies of old and treasured analog recordings — from old shellac 'home recording' discs, or old 78/45/33.3rpm commercial pressings, or even old reel-to-reel magnetic tapes. As part of the copying process you can often take the opportunity to 'clean up' the old recordings, by removing irritating imperfections such as surface noise and crackle. There are now some excellent programs available to do this, like DART Pro 32 and Diamond Cut.

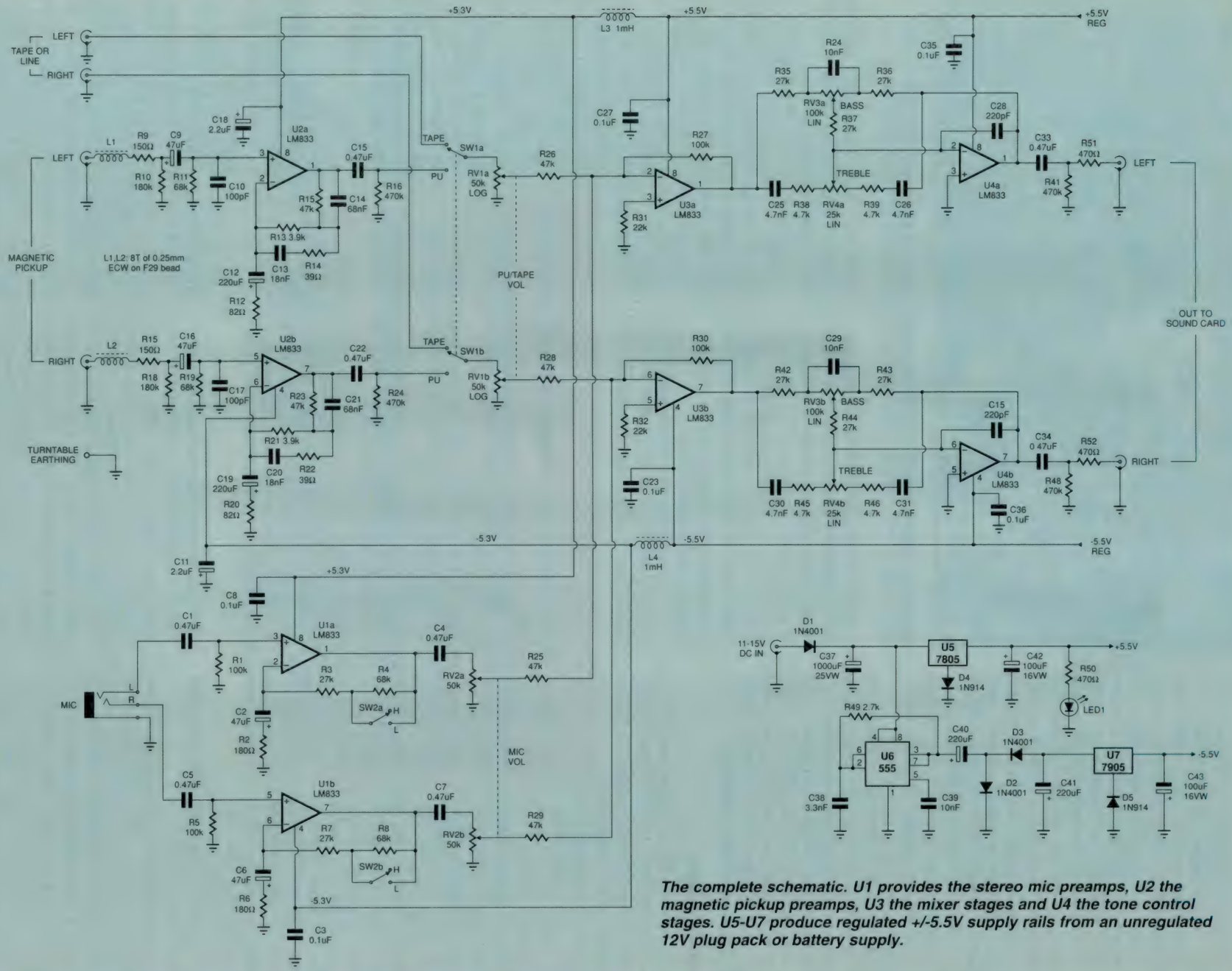
It's a bit of a squeeze, but with care everything fits into one of the small sloping-front instrument cases.

If you've tried doing any of this copying, though, you've probably found that there's more to it than simply hooking up your old analog turntable or tape recorder to your PC's sound card. Things are never that easy, are they?

For example most hifi turntables were fitted with a magnetic cartridge, which needs to be fed through a preamp with the correct RIAA equalisation in order to produce 'flat' signal levels suitable for feeding a sound card. And even though the signals from your tape recorder or deck might be adequate in level, you might want to do a spot of pre-equalisation — perhaps to boost the bass a little, or reduce the level of tape hiss, or correct other deficiencies in the original recording. (It's generally not a good idea to rely wholly on the software DSP facilities to bring the signals 'up to scratch'...)

You might also want to be able to hook up a microphone, to add some narration or a spoken introduction to the recordings you're transcribing. Most sound cards do have a mic input jack, but this is usually not easy to access, and it's often simply disabled when the line inputs are used. Generally it's much more convenient to have an external mic preamp and mixing setup. (The performance can also be significantly better, because the response of the mic preamp in many sound cards is quite poor.)

In short, there's really a need for a flexible 'recording front end' unit, to interface between the PC's sound card and these audio signal sources, and provide gain and equalisation. Needless to say that's the very purpose of the handy little unit described in this article.



The complete schematic. U1 provides the stereo mic preamps, U2 the magnetic pickup preamps, U3 the mixer stages and U4 the tone control stages. U5-U7 produce regulated +/-5.5V supply rails from an unregulated 12V plug pack or battery supply.

'Front End' for PC Audio Recording

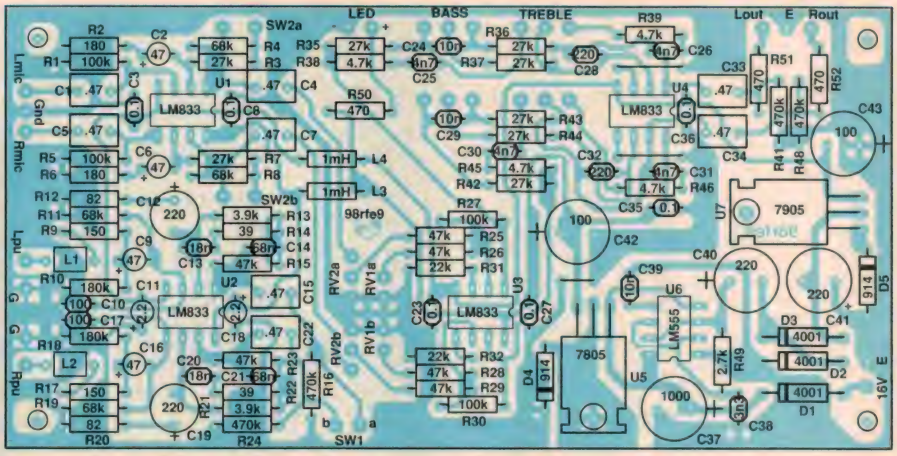
What it does

Basically the unit consists of four circuit sections: a stereo magnetic pickup preamp, with the appropriate gain and RIAA equalisation for 'conditioning' the signals from a magnetic pickup; a stereo mic preamp, with sufficient gain to operate with most common dynamic or electret microphones; a simple two-input stereo mixer, to allow control of the signals from the mic preamp and either the magnetic pickup preamp, or a Tape/Line level stereo input; and finally an active tone control circuit with bass and treble controls, each capable of around 12dB of either boost or cut.

It all fits in a compact sloping-front utility box, and operates from a low cost nominal 12V DC plug pack supply (or a 12V battery supply, if you prefer).

With the unit, your PC and its sound card are provided with all of the basic facilities for convenient digital audio recording.

By the way, the facilities it provides really aren't restricted to use with a PC sound card. You could also use it as a very basic 'recording console' for commercial audio CD recorders and DAT recorders...



Here's the overlay diagram for the PC board. There are only three wire links — one either side of U4, at upper right, and the third just above U5 and below C42.

How it works

Each of the four functional circuit sections is based on an LM833 low noise dual op-amp, as you can see. The mic preamps use U1, the magnetic pickup preamps U2, the mixer stages U3 and the tone control stages U4. We'll now look at these briefly in turn.

The mic preamp stages (U1a/b) are quite conventional, with negative feedback used to determine the voltage gain. Switch SW2a/b allows the gain of each stage to be set to either 'High' or 'Low', corresponding to a total gain of around 1050 or 300 respectively (60dB or 50dB), to suit either low output or higher output microphones. The frequency response of the mic preamps is essentially flat, within 2dB from 35Hz to 18kHz.

The magnetic pickup preamps (U2a/b) are also quite standard, using a well-proven configuration and circuit values as used in Rob Evans' recent Playmaster Pro Series Control Unit No.4. The feedback circuitry (R12-15, C12-14 etc.) gives a very close approximation of the correct RIAA equalisation characteristic, to ensure a clean and balanced output from the majority of magnetic cartridges (moving magnet type). The preamp gain is around 35dB at 1kHz.

As you can see the output of the magnetic pickup preamps is taken to switch SW1a/b, which allows you to select either the magnetic pickup signals or those at the Tape/Line level inputs, as your inputs for the 'PU/Tape' channel of the mixer — controlled by ganged volume pots RV1a/b. The outputs from the mic preamps are taken directly to the 'Mic' channel volume pots RV2a/b.

The mixing stages (U3a/b) are again very conventional, with resistors R25-27 and R28-30 used to achieve low interaction 'virtual earth' mixing of the two input channels. With the resistor values shown the maximum mixer gain is two (6dB), and this becomes the 'flat' gain of the complete circuit for signals fed into the Tape/Line inputs.

The tone control stages (U4a/b) are also quite standard, using the time-honoured Baxandall feedback circuit. This provides bass and treble controls, each with the ability to achieve up to about 12dB of boost or cut (at 50Hz and 15kHz respectively), and with very little interaction. In the 'flat' positions of the controls the overall response is within 1dB from below 30Hz to around 25kHz — significantly better than most sound cards themselves.

The mixing and tone control circuitry has the ability to provide over 6Vp-p output before clipping, into the line input circuitry of a typical PC sound card (roughly 40 - 50kΩin parallel with about 1nF). This means that at the 2Vp-p maximum input level needed by the Line inputs of most sound cards, the distortion is quite low — typically less than 0.05%.

The op-amps in all four signal processing sections of the unit operate from regulated +/-5.5V supply rails. These are derived from the nominal 12V DC input by a simple on-board power supply circuit. Regulator U5 provides the +5.5V rail directly, while the negative rail is generated by a simple polarity-inverting circuit which uses 555 timer U6 as a self-oscillating power chopper, driving C40/41 and D2/3 as a charge-pump rectifier driving negative regulator U7. With a nominal 12V DC input the negative voltage generated across C41 is around 9.5V under load, giving plenty of 'headroom' for U7.

Note that in this project the inverting chopper U6 is intentionally operated at around 70kHz, to minimise the possibility of interference with either the audio signals themselves or the sampling clock of the PC sound card.

As you can see both U5 and U7 have 1N914 (or similar) diodes in series with their common lead, to increase their outputs by about 0.5V. This has been done to allow for the voltage drops in decoupling chokes L3 and L4, ensuring that preamp chips U1 and U2 still receive more than the minimum

Brief Specs

An audio preamp/mixer/tone control unit to facilitate digital audio recording with a PC and sound card.

Magnetic Pickup Preamps: Low noise, provide full RIAA equalisation for use with moving-magnet cartridges. Provide approximately 35dB gain at 1kHz (total effective gain 41dB). Input impedance 50k.

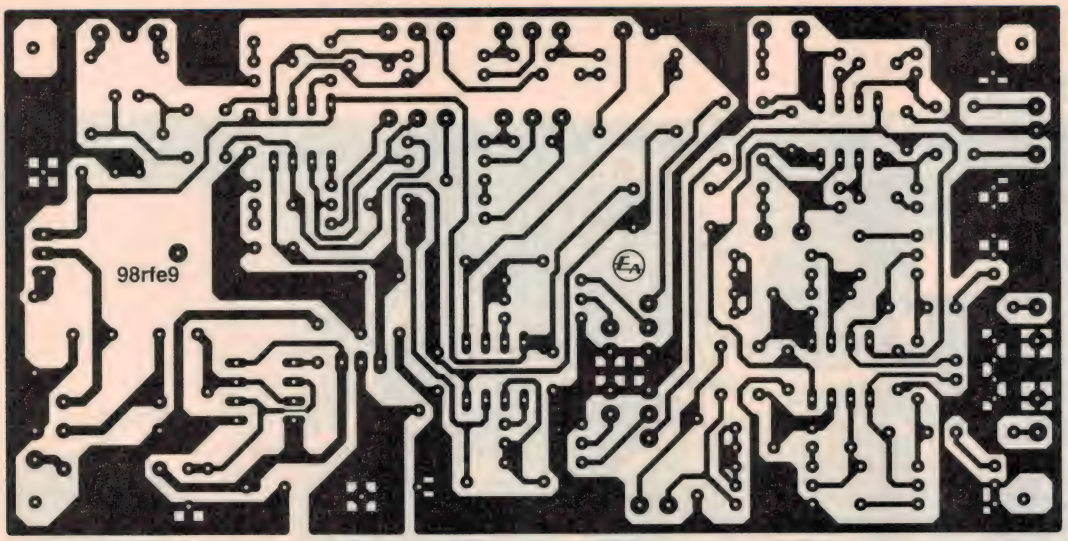
Microphone Preamps: Low noise, provide selectable total effective gain of either 1050 (60dB) or 300 (50dB) to suit mic output. Response flat within 2dB from 35Hz to 18kHz. Input impedance 100k.

Mixer: Basic two-channel active stereo mixer, able to control levels from Mic and Pickup-Tape/Line inputs independently. Tape/Line input sensitivity 350mV RMS for 2Vp-p output at 1kHz; input impedance 50k.

Tone Controls: Active Baxandall type, with independent bass and treble controls providing up to 12dB boost or cut at 50Hz and 15kHz. The 'centred controls' response of mixer and tone control stages is flat within 1dB between 20Hz and 20kHz, with in-band noise around -70dB below 2Vp-p output.

Power Source: 11 - 15V DC, from external plug pack supply or battery. Current drain approximately 95mA, power consumption 1.2 watts.

Use the inside view above as a guide when you're wiring up your own unit. Note, however, that the wiring to the tone controls and mic volume pots should be dressed so that it is kept as far away from the power supply chopper circuitry (i.e., U6, C40-41 etc) as possible, when the case is closed. This minimises pickup of the 70kHz switching signal. Note also that this prototype uses an earlier version of the PCB, which had no provision for on-board mounting of output series resistors R51-52 — that's why they're visible 'hanging off' the output terminal pins. At right is a rear view of the assembled unit.



At left is the PCB etching pattern for the project, while at right on the facing page are the patterns for the front and rear panels. All are shown actual size so they can be used for making your own if you wish. Photocopies can also be used as templates for drilling the holes in your case.

allowable voltage (+/-5V).

By the way, the schematic shows the project's allowable DC input voltage range as 11-15V. At the top end this allows a comfortable margin for the 555 chip (U6), which has a maximum voltage rating of 18V. If you do use a plug-pack supply with a nominal DC output of higher than 12V, make sure it doesn't rise above 18V under light loading conditions.

Construction

The unit is housed in a small sloping-front utility case, with most of the components mounted on a PC board measuring 139 x 70mm, and coded 98rfe9. The PCB mounts horizontally in the bottom of the case, with the controls mounted on the sloping front panel. The input and output connectors are mounted along the rear of the case.

The case used for the prototype measures 190 x 120 x 65/36mm, but other similar cases may be compatible — the main thing to watch is the minimum internal height, to ensure clearance between the components on the PCB and those on the front panel. Things are fairly tight, especially just below the two mixer pots.

Because the case is predominantly plastic, and provides very little shielding, a small 'shield plate' cut from unetched PCB laminate is mounted under the main PCB, with its copper layer connected to signal earth. The metal front panel and the controls mounted on it are also earthed, for the same reason.

The overlay diagram and internal photos should give you a good idea of where everything goes, and its orientation. I suggest that you begin construction by fitting all of the smaller components to the PCB, using the overlay and schematic as a guide.

It's easiest if you begin by fitting the PCB terminal pins first; there are 42 of these, used for all of the off-board connections. Then fit the three wire links and all of the resistors, as they're all mounted horizontally and have a low profile. You can follow these with the three power diodes D1 - 3 and signal diodes D4-5, making sure that they're all orientated correctly.

If you're going to use DIL sockets for the five ICs, these could now be fitted. (It's up to you whether sockets are used, as the arguments for and against are closely balanced. Sockets will allow convenient replacement of chips in the future, but are also in themselves a significant source of unreliability. They were only used in the prototype unit pictured to allow testing of different chips during development of the project. If I were building up another unit myself, I'd forget the sockets and fit the ICs directly to the board...)

PARTS LIST

Resistors

All 0.25W, 1% metal film unless specified:

R1,5,27,30	100k
R2,6	180 ohms
R3,7,35,36, 37,42,43,44	27k
R4,8,11,19	68k
R9,17	150 ohms
R10,18	180k
R12,20	82 ohms
R13,21	3.9k
R14,22	39 ohms
R15,23,25, 26,28,29	47k
R16,24,41,48	470k
R31,32	22k
R38,39,45,46	4.7k
R49	2.7k
R50,51,52	470 ohms
RV1,2	Dual 50k log pot
RV3	Dual 100k linear pot, centre indent
RV4	Dual 25k linear pot, centre indent

Capacitors

C1,4,5,7, 15,22,33,34	0.47uF MKT
C2,6,9,16	47uF 3VW TAG tantalum
C3,8,23, 27,35,36	0.1uF monolithic
C10,17	100pF ceramic
C11,18	2.2uF 16VW TAG tantalum
C12,19	220uF 10VW RB electrolytic
C28,32	220pF ceramic
C13,20	18nF MKT
C14,21	68nF MKT
C24,29,39	10nF MKT
C25,26, 30,31	4.7nF MKT
C37	1000uF 16VW RB electrolytic
C38	3.3nF MKT
C40,41	220uF 16VW RB electrolytic
C42,44	100uF 10VW RB electrolytic

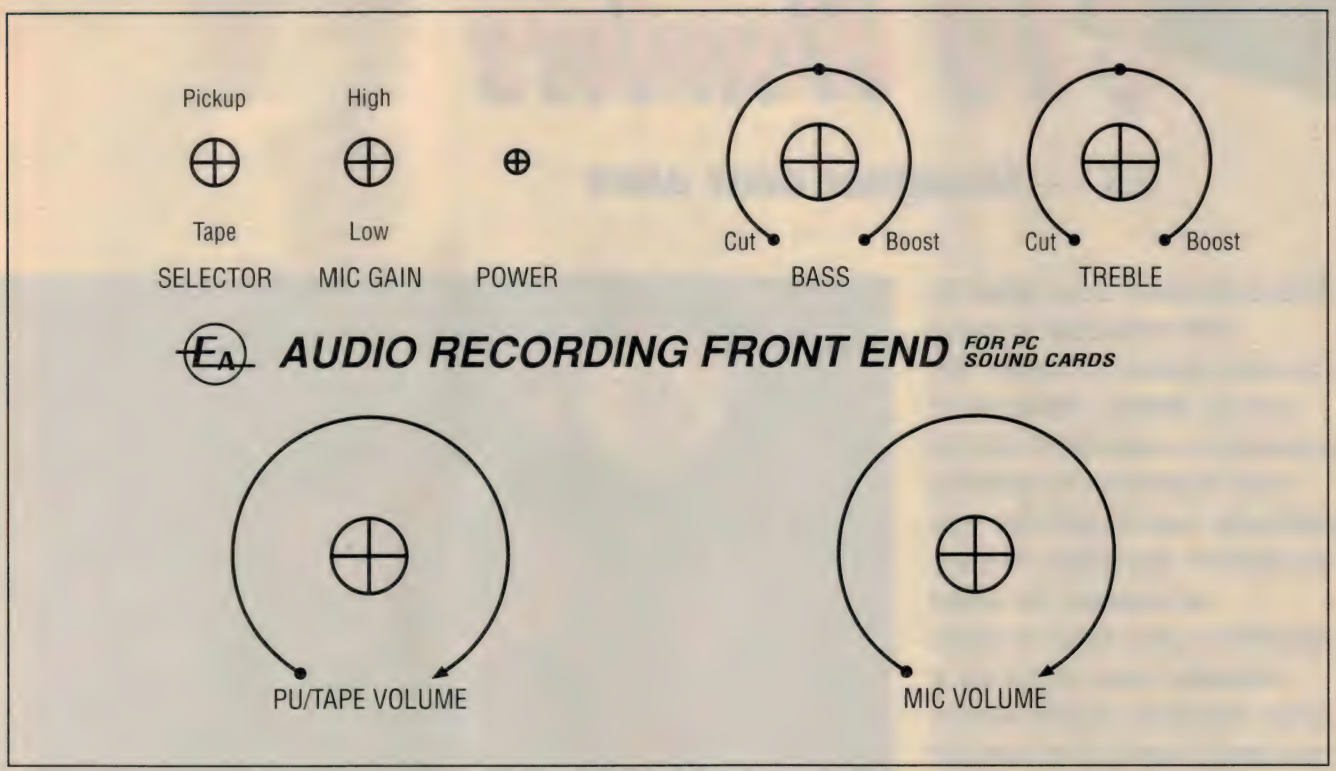
Semiconductors

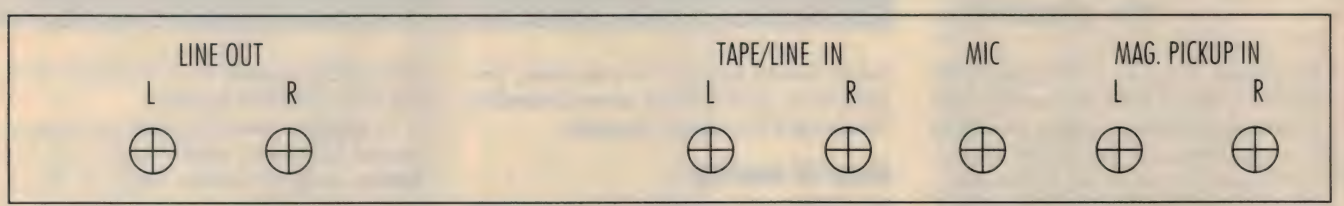
U1,2,3,4	LM833
U5	7805 +5V regulator
U6	LM555 timer
U7	7905 -5V regulator
D1,2,3	1N4001 power diode
D4,5	1N914 (or 1N4148) diode

Miscellaneous

L1,L2	8T 0.25mm ECU on F29 ferrite bead
L3,L4	1mH RF choke
SW1,2	Miniature toggle switch, DPDT
LED1	3mm red LED

Sloping-front case, 190 x 120 x 65/36mm or similar; PCB, 139 x 70mm, code 98rfe9; piece of unetched PCB laminate, 139 x 70mm, for shield plate; 42 PCB terminal pins; five 8-pin DIL sockets (optional); front panel dress plate, 175 x 100mm; rear panel dress plate, 175 x 25mm; six RCA sockets, panel mount; 3.5mm stereo jack socket, panel mount; 2.1mm or 2.5mm concentric power input socket, panel mount; one screw terminal, black; shielded audio cable, rainbow ribbon cable for off-board connections; four 12mm x 3mm dia machine screws, countersink head, with eight matching nuts and star lockwashers; solder, etc.





Next you can fit the smaller ceramic and MKT capacitors, followed by the larger MKTs, TAG tantalums and aluminium electrolytics. (Take care with the orientation of the latter parts, as they're polarised.) Then you can fit the two decoupling chokes L3 and L4, and wind the two small RF suppressor inductors L1 and L2 — each of which is made from eight turns of 0.25mm enamelled copper wire on a single-hole 'bead' of F29 high-frequency ferrite.

With the passive parts all fitted to the board, I suggest that you next fit only the three power supply ICs: inverting chopper U6 and regulators U5 and U7. The latter both mount horizontally, with a 9mm x 3mm diameter machine screw and nut to attach them securely to the board and provide minor additional heatsinking.

With these fitted, and before you fit the four op-amp chips, you can connect up the board to the plug pack supply or another convenient source of 12V DC, and make sure the power supply section is working as it should. This will help avoid possible damage due to wiring errors.

With the 12V source connected, a DMM should be able to measure +5.5V at the output pin of U5 (the pin nearest C27), and -5.5V at the output pin of U7 (the pin nearest C43). Similarly you should find about +11.5V at pin 8 of U6, and around -9.5V at the anode of D3 (the end furthest from R49, towards the end of the PCB).

If these voltages all check out correctly, you can switch off the supply and confidently proceed with the assembly by fitting the four op-amp ICs (U1-4). Your completed board assembly can then be placed aside while you prepare the case.

A photocopy of the front panel artwork can be used as a template for drilling and reaming the holes in the panel for the pots, switches and LED. I suggest you use the actual controls as a guide to the final holes sizes, as bush sizes can vary significantly. You might also want to drill 'blind' holes from the rear of the panel, to accept the locating spigots for the pots and switches; this prevents them from rotating later, without the need for excessive tightening of the mounting nuts.

If you're using a dress panel based on our front panel artwork, this can be applied carefully after the panel is prepared, and the holes cut out with a hobby knife using those in the main panel as a guide.

With the panel now prepared, I suggest that you fit the LED into its close-fitting 3mm hole, and cement it in place with a dob of epoxy glue or similar at the rear. The panel can then be placed aside for a while, to allow the glue to set.

The holes for the rear connectors can be drilled and reamed next, using the connector ID label artwork as a guide. Most of the connectors are single-hole RCA sockets, which need a hole 6mm in diameter. This is also the hole size needed for the 3.5mm mic jack. The size of the holes for the power connector and turntable earthing terminal will depend on these components themselves.

The only remaining holes are those for mounting the PCB assembly in the bottom of the case. These are 3mm in diameter, and can be marked out using a photocopy of the PCB artwork as a template. If you're using countersink-head screws as I did, you'll need to countersink the holes on the outside of the case to suit.

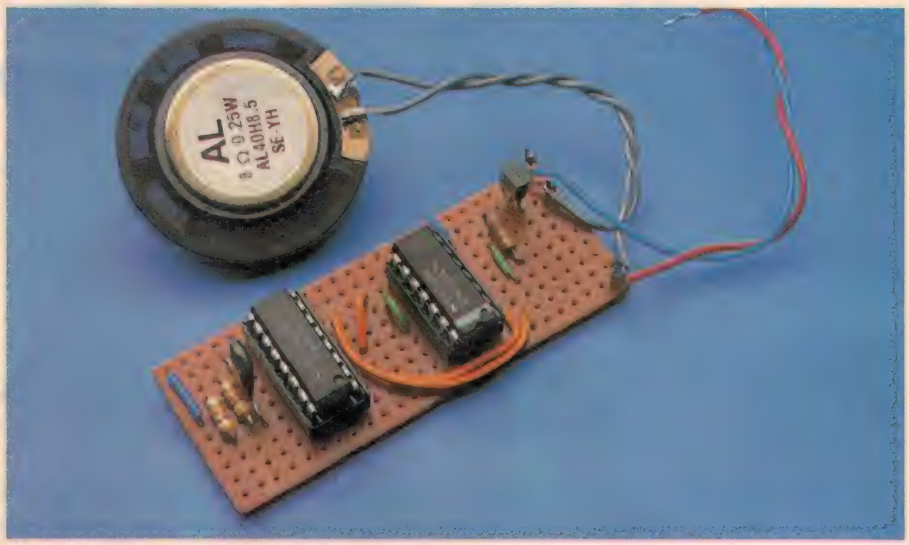
If your 139 x 70mm rectangle of unetched copper (for the shield plate) is not already drilled, you can use the PCB artwork copy as

(Continued on page 73)

$10 Wonders

15 — Designer door alert

This twin-tone door alert is not intended to be a raucous alarm to wake the whole family. Instead, it produces a well-bred signal that someone is waiting patiently (we hope!) for you to answer the door. It can, of course, be used anywhere you want a more friendly tone, such as a shop doorway alarm where you don't want to scare off the customer...



This project is called a 'Designer' alert because you can tailor the sound to suit your own preferences, simply by making a few modifications to the circuit connections. (I'll go into more details on this later.)

Pressing a switch activates the alert and, since this is a fairly simple and inexpensive circuit to build, the price of a real front door push-button is included in the ten dollars — but any kind of switch will operate it. For example, it could be used in a shop to warn you that a customer is waiting, with a micro-switch attached to the shop door. Or you could fix a suitable switch to the front gate to inform you that visitors are imminent. Athough its basic sound is reasonably genteel (but insistent enough to be easily heard), you can, if you want, program it so give a much more demanding 'Hurry-up-I'm waiting' clamour.

How it works

The sounds are generated by an oscillator included in IC1 (Fig.1), which also contains a 14-stage binary divider. The frequency of the sound is determined by the values of C1 and R2, where f= 1/(2.2RC).

With the values given in Fig.1 the clock frequency is almost exactly 20kHz. This goes through four stages of binary division before we see it again at pin 7. Four binary stages are equal to division by 16, so the signal at pin 7 has a frequency of 1.25kHz. This is comfortably within the audio range and makes a suitable basic frequency for the rest of the circuit's operation.

To obtain a two-tone signal we require a second frequency, which we pick up from further along the divider chain. In the circuit we are showing here we are using the output from stage six, which is one quarter the frequency of stage four — in other words just over 300Hz.

Further still along the chain, the frequencies drop below the audio range. For example at stage 13 the frequency is $20kHz/2^{13} = 2.44Hz$. This is inaudible (except as distinct 'clicks'), but is useful enough for controlling the two-tone effect. We'll refer to it as the control signal.

The two audio signals from pins 7 and 4

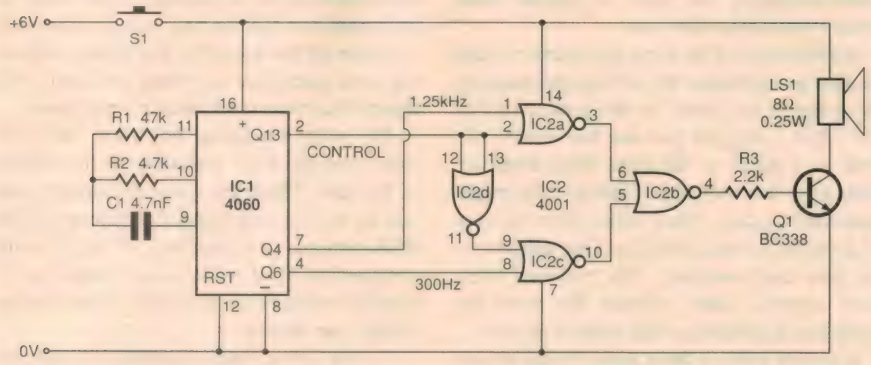


Fig.1: The heart of the circuit is IC1, which combines a 'clock' oscillator with a 14-stage binary counter. We use selected outputs from IC1 to both make the audio tones and control them, via IC2.

Table 1: Frequencies available from IC1 (relative to the basic frequency at pin 7)

Pin	Relative freq.	
7	1	) Suitable
5	1/2	) for
4	1/4	) audio
6	1/8	) signals
14	1/16	
13	1/32	
15	1/64	) Suitable
1	1/256	) for
2	1/512	) control
3	1/1024	) signals

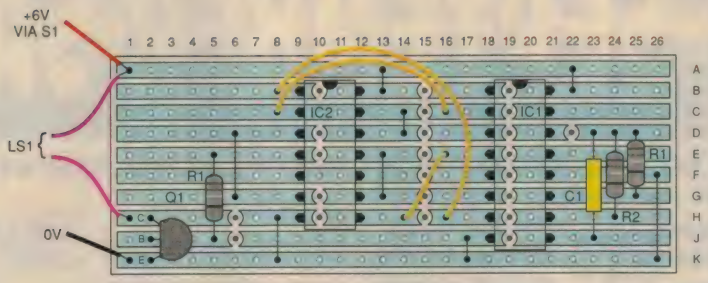


Fig.2: Here's the wiring diagram for the door alert, as built on a piece of stripboard.

are taken to a pair of NOR gates in IC2 (gates a and c). Each of these also receives a version of the control signal. Gate a receives it directly, while gate c receives it after it has been inverted by gate d. Gate d has its two inputs wired together so it operates as an inverter (or NOT) gate.

When the control signal is low, gate a passes the 1.25kHz signal and (since the inverted control signal is high) the output of gate c is held low. On the other hand when the control signal is high, the 300Hz signal passes gate c and the output of a is low. The outputs of a and c are fed to gate b which acts as a mixer.

In this way transistor Q1 receives the two audio signals alternately. The transistor switches current through the loudspeaker and we hear a two-tone sound.

Design options

For anyone with time to spare, there is quite a lot of scope for playing around with the values and connections in this circuit, and a varied range of effects is possible. Here are some pointers to get you started:

- The basic tone is set by the frequency of the oscillator. Set this by choosing suitable values for R2 and C1, remembering that the frequency is divided by 16. Having done this, make the value of R1 around 10 times R2. If you want a really high tone, you can take the signal direct from pin 9. Just remember that you might not hear it if the oscillator is working above 15kHz and your ears are not as young as they were! If so, try increasing C1 a bit.
- The frequency of the alternate tone is derived by tapping the divider chain at different points. We have tapped stage six to get a 4-to-1 frequency ratio. Other tappings produce quite different sounds and Table 1 shows what is available.
- The rate of tone change is decided by where the control tap is placed. Generally stages 10 to 14 are the most suitable, but interesting warbling effects are produced by using one of the earlier stages.
- There is no volume control in this circuit. Volume is plentiful with R3 as shown, but you could increase R3 to produce a softer tone.

Construction

The circuit is intended to operate on 6V, either from a 6V mains plugpack (non-regulated) or a battery pack of four AA cells. Since it takes current only when the button is pressed, the batteries should last you a long time. The project is best housed in a small plastic box, with an aperture cut for the speaker. We used a 40mm Mylar miniature speaker, which is easily glued to the panel by its rim. Firm mounting is essential if you want maximum sound volume.

If you want to experiment with the connections, it is best to wire up the circuit on a breadboard, and start tinkering! There's lots of room on the stripboard to make changes to the circuit if you change your mind later on.

Assemble the circuit on stripboard (Fig.2) noting that the strips are cut in some places beneath the board, but NOT at C10 and F10. Solder blobs can be used to join adjacent strips at certain places, including pins 12 and 13 of IC2. You may decide to alter some of the connections between the ICs (the orange wires in the photo) either now or later. ❖

Parts List

Resistors

Carbon or metal film 5 %, 0.25 W

R1	47k
R2	4.7k
R3	2.2k

Capacitors

C1	4.7nF MKT or greencap

Semiconductors

IC1	4060 14-stage counter/divider with oscillator
IC2	4001 quad 2-input NOR gate
Q1	BC338 NPN transistor

Miscellaneous

SW1	N/O pushbutton switch
LS1	Miniature loudspeaker, 8Ω, 1/4W;

Matrix board 17 x 39mm (10 strips x 26 holes); 3 x 1mm terminal pins; 14-pin IC socket; 16-pin IC socket; wire for linking push-button to circuit.

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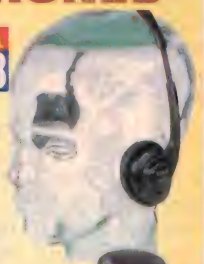

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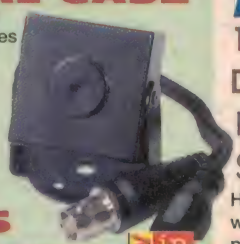

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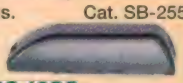

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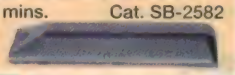

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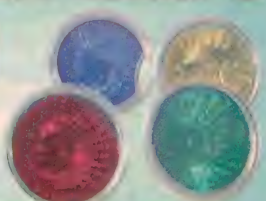

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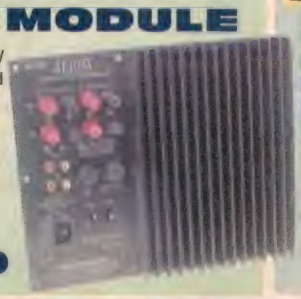

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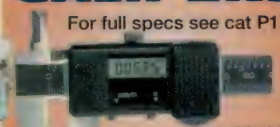

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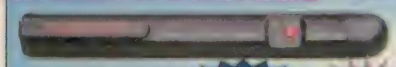

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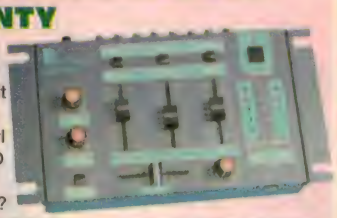

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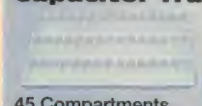

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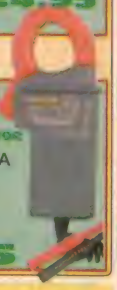

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Intelligent Baby Alarm

Here's an interesting and low cost project based on the popular BASIC Stamp microcontroller module. It's a flexible baby minder, which is easy to build and program (from your PC), but also offers plenty of opportunities for adding extra 'frills'.

by Owen Bishop

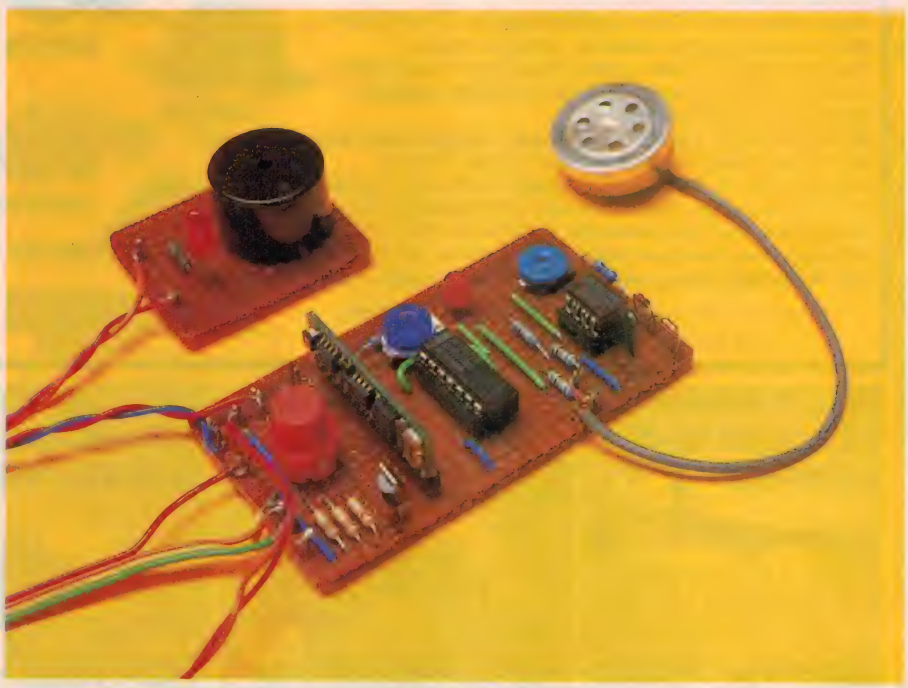
This is a BASIC Stamp (or Counterfeit) micro-based project, which can look after baby more 'intelligently' than the typical alarm system. Although it can be programmed in Immediate mode to sound the alarm every time baby makes a tiny snuffle, the project works on the assumption that we are not interested in the occasional sneeze, cough or whimper that baby makes. It is only when there are several such sounds within a given period of time that we need to be informed about it.

In its Normal mode the alarm registers each disturbance, but it sounds the alarm only when it has recorded a significant number of disturbances within a few minutes of each other. It is programmed to have a relatively short memory, so that sounds made a few minutes ago are automatically 'forgotten'. The parameters of the Normal mode can be set both for the recording time interval and the critical number of detected sounds.

The third mode, called the OK mode, is one that is a novelty for baby alarms. This gives us a reassuring beep or two every 10 minutes or so if it has detected no sounds in that period. Nice to know that baby is sleeping quietly! The OK mode also includes the Normal mode function and you can set different parameters for sounding the alarm.

The alarm sounder, or audible warning device (AWD) recommended for this system is a low-level piezoelectric beeper. A device such as this is perfectly adequate for normal domestic use. You could use a 120dB siren instead and rouse the whole neighbourhood every time baby hiccups, but do you really need to? An LED is mounted beside the bleeper so we have both audible and visible warnings.

Certain types of alarm system relay the actual sounds from the nursery, but we find this irritating — especially to guests. The low-level beeper is much more discreet and provides the warning just as effectively. When the alarm is triggered, the AWD gives five short beeps and then remains silent for 20 seconds. This gives you time to go to the nursery, reset the system, and attend to baby. The beeping is repeated every 20 seconds until you do this, for there is no way of switching off the alarm in the living room. Discreet, but persuasive!



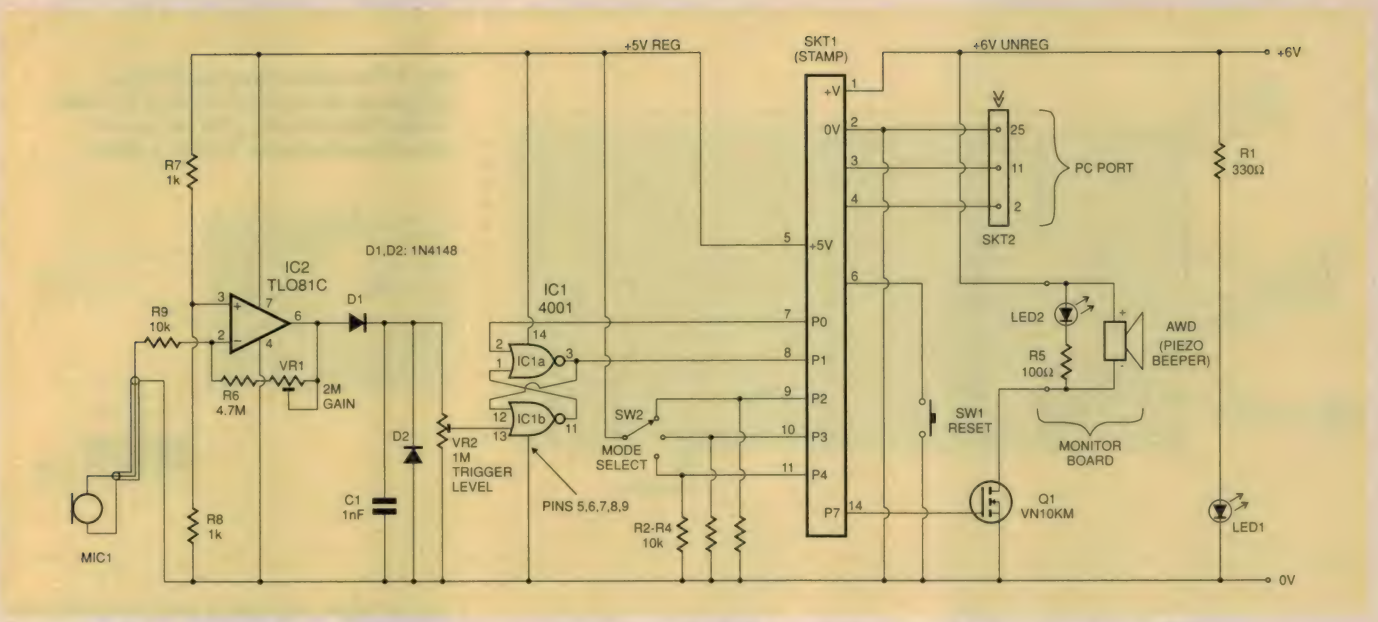
The 'works', with the BASIC Stamp visible at lower centre.

How it works

This design leaves scope for several modifications according to your preferences, so we have built it on stripboard. Fig.1 shows that the circuit is, as usual, centred around the Stamp module, plugged into SKT1. The other socket, SKT2 is for the programming lead, connected to the PC during the initial stages of testing and setting up the circuit.

The system runs on 6V DC and needs only 13.5mA when quiescent and about 60mA when beeping. This means that it should run for over 100 hours from a set of four type AA alkaline cells in a battery-holder. Or you can use a 6V DC (must be DC, but can be unregulated) plug-pack.

The circuit has an LED (LED1) acting as a pilot lamp. This is on the main board and, since this is in the darkened nursery, we have used a 330Ω series resistor to limit the current to about 10mA. This gives quite enough light to be seen in a semi-darkened room. SW1 is the reset button; pressing this resets the Stamp to run the program from the



The complete schematic. The BASIC Stamp plugs into SKT1, while SKT2 is used to download its program from a PC.

beginning. Pins P2, P3 and P4 are used as inputs to read the setting of SW2, the Mode Select switch. This is a three-way rotary or slide switch. These inputs are normally held at logic low by the pull-down resistors R2 to R4. The switch connects the selected input to the +5V line (from the Stamp's internal regulator), taking it to logical high.

The switch we used for SW2 in the prototype is a double-pole switch. It is feasible to use the other half of this to switch on additional LEDs to indicate which mode has been selected, if you wish.

The output to the monitor board (located in the living room) is switched by MOSFET Q1, controlled by the output from pin P7. Only a twisted pair of ordinary light-duty cable (hook-up wire) is required to link the monitor board to the main board. There are two spare pins available (P5 and P6) so it would be possible to program more elaborate warnings — for example to allow the AWD and LED2 to be controlled individually, but this entails having a cable of three or more wires, which is more expensive.

Sound is picked up by the microphone (MIC1) placed near baby's cot. A cheap crystal microphone insert is all that is needed, as we are not concerned about high fidelity. The output from this is fed to an operational amplifier (IC2) wired as a high-gain inverting amplifier. The gain is adjustable by means of VR1.

You could use a rotary pot for this, mounted on the front panel of the enclosure and provided with a knob. In practice the setting initially made is usually good enough for permanent use, so a trimpot on the circuit board does just as well. This also has the advantage that it is inaccessible, so the sensitivity can't be accidentally turned down.

The alternating output from the op-amp is rectified by the two diodes D1 and D2, connected as a 'diode pump'. Each time the output goes positive, current flows through D3 and increases the charge on C1. D2 prevents the charge falling when the output goes negative. In a few oscillations the charge is pumped up to a level sufficient to trigger the alarm.

The charge leaks slowly away from C1 through VR2, which is set to give a level a little below 2.5V. This it equivalent to a logical low at the input to the set/reset flip-flop formed by the two cross-connected NOR gates. The other input to the flip-flop (IC1, pin 2) is held low by the output from pin P0 of the Stamp. In this condition there is a low output from the flip-flop at pin 3, fed to Stamp pin P1, programmed as an input.

When a sound is detected the voltage at the wiper of VR2 rises above 2.5V and counts as a high input to the flip-flop. This sets it, and its output to P1 goes high. This can be read by the program, after which a low pulse at P0 is used to reset the flip-flop. The Stamp continually reads the input at P1, and when a high input is received it records that fact and, if appropriate, sounds the alarm.

Construction

The circuit is best housed in a small plastic enclosure (jiffy box). If you are powering the circuit from a battery, use a box big enough to hold the battery as well as the main board. Mount a power ON/OFF switch on the front of the enclosure.

Of the components on the main board, only the reset button SW1 needs to be accessible. You may be able to mount the board so that this can be reached through a hole cut in the front of the enclosure. LED1 must also be visible. As mentioned above, VR1 and VR2 could also be mounted on the enclosure. The Mode Select switch SW2 also needs to be mounted on the enclosure.

You could provide mounted sockets for connecting the lead joining the main unit to the monitor and to the microphone, but we prefer a soldered connection as this is less likely to become unplugged. If you are able to locate the main unit close to the head of the cot, the microphone could be mounted on the enclosure. Coaxial cable is used to connect the microphone to avoid pick-up of electromagnetic interference. The sheath of the cable is connected at one end to the 0V rail of the board and at the other end to the metal case of the microphone.

The monitor board is mounted in any conveniently small plastic box, with apertures for the sound and light to emerge.

When assembling the circuit note, that the strips are cut in several places. In particular note that there are NO cuts at H15, L15 and M15 underneath IC1. Also note the solder blob joining pins 5, 6 and 7 of the socket of IC1.

Testing it

The sound input interface is best tested before inserting the Stamp in its socket. Use a short length of wire to link sockets 1 and 5 of SKT1; this provides a 6V supply for powering the ICs. In the same way, link socket 7 (P0) with socket 2 (0V) to ground the reset input of the flip-flop. Use a test meter to measure the voltage at the wiper of VR2. This should be between 2V and 2.5V. Adjust VR2, if necessary, to obtain this. Set VR1 about midway along its track.

Now make a noise reasonably close to the microphone. The microphone is most sensitive to high-pitched shrieks and cries but, if you are too embarrassed to make baby-nois-

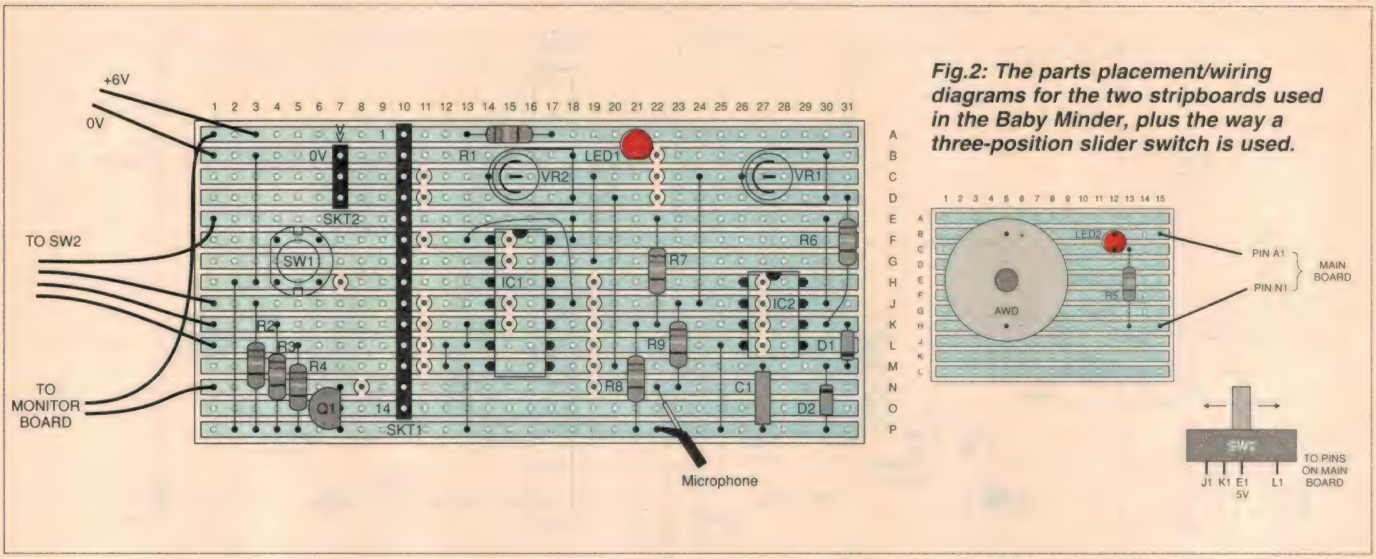
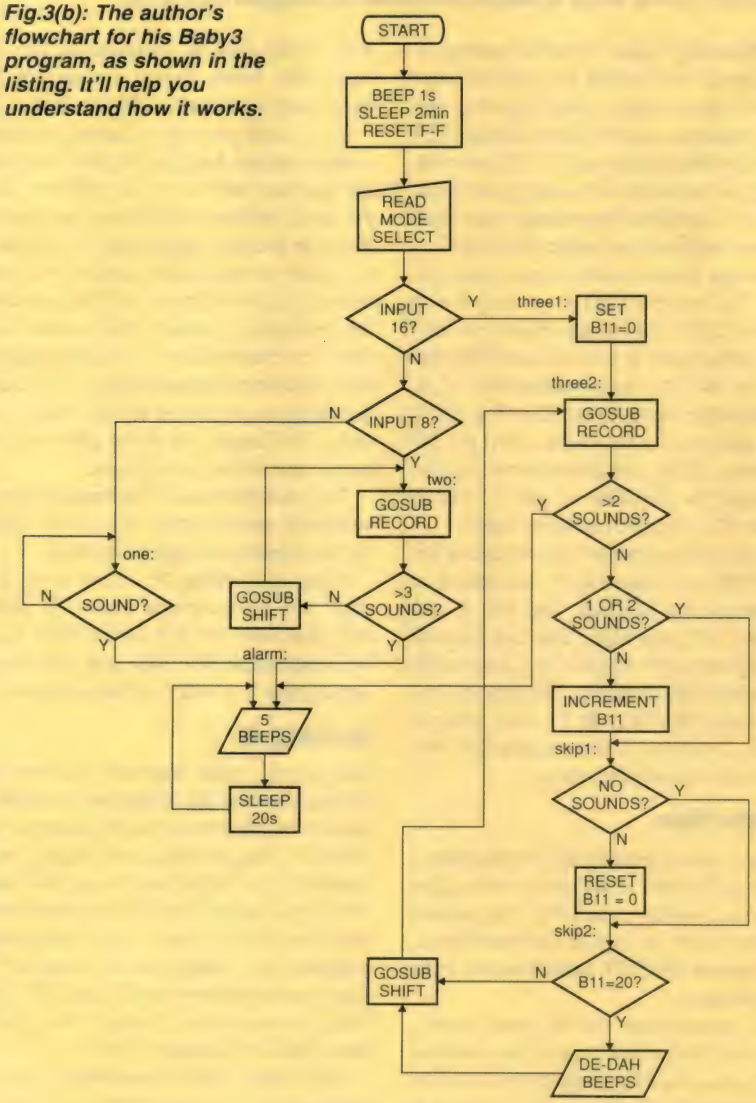


Fig.2: The parts placement/wiring diagrams for the two stripboards used in the Baby Minder, plus the way a three-position slider switch is used.

Fig.3(b): The author's flowchart for his Baby3 program, as shown in the listing. It'll help you understand how it works.



es, or when your family gets fed-up with the hullabaloo, clap your hands or flick your fingers instead. Such transitory sounds may be over too quickly with a moving-coil meter, but a digital meter will flash up some values exceeding 2.5V. Measure the voltage at IC1 pin 3; it should be 6V.

Now reset the flip-flop by briefly connecting socket 7 to +6V. The voltage at pin 3 should have changed to 0V. Try setting and resetting the flip-flop this way several times to confirm that it works reliably.

Test program

With the Stamp in its socket (right way round as indicated by the pin numbers '1' and '14' in Fig.2), and the programming lead connected to the PC, switch on the 6V supply. The marked side of the programming lead socket goes to the end of SKT2 marked with a double-chevron in Fig.2.

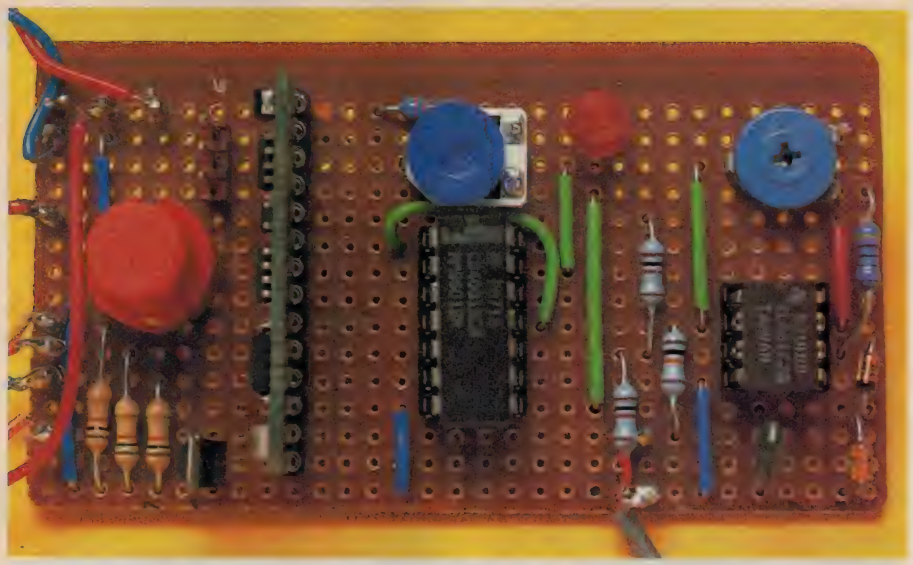
Run the Stamp program on the PC. Usually the first thing that happens is that the alarm starts to sound. To get this under control, type in the beginning of the first test program:

```
'Testit1
high 7
pause 1000
low 7
```

This causes a high output from pin 7, lasting one second. The alarm sounds for one second and is then silent. Now type in the rest of the program:

```
'Testit1
high 7
pause 1000
low 7
readit:
input 2
debug #pin2
pause 100
goto readit
```

This is for testing the Mode Select switch.



A closeup of the author's main stripboard, with the BASIC Stamp module visible just left of centre.

With the switch in position 1, the debug command produces a series of ones on the screen. Switching to positions 2 or 3 gives a series of zeros. Edit the 6th and 7th lines of the program to test positions 2 and 3 in the same way. Now test the flip-flop action, using Testit2:

```
'Testit2
high 7
pause 1000
low 7
low 0
debug #pin1
high 0
low 0
debug #pin1
```

The initial one-second beep from the AWD triggers the flip-flop (normally the AWD is in another room, so it doesn't trigger the system). The 'low 0' puts the reset at zero, which does not affect the flip-flop. The first debug displays a '1', showing that the flip-flop is set (by the bleep). The high 0 followed by low 0 resets the flip-flop and the second debug displays 0, showing that this has been done.

If you amend the first line to 'low 7' there is no sound from the bleeper and both debugs give a 0. Also try making a noise (clap etc) during the initial 1-second of silence, to obtain 1 followed by 0. This completes the testing.

Programming

The program given in Fig.3, together with its flow chart, illustrates the main features that an intelligent baby alarm might have, but there is plenty of scope for you to modify it and add your own facilities. The program occupies about two-thirds of Stamp's memory, so there is enough room to spare for a few more routines.

We have left two of the Stamp's pins unused, so there is the possibility of interfacing additional circuitry.

The program begins by turning on the beeper for one second. This confirms that the program is running and also that the electrical connection to the monitor board is intact. Then we put the Stamp to sleep for two minutes (if only baby would go to sleep so obediently, there would be no need for an alarm!); this is to give you time to say your goodnights and get out of the nursery, and for baby to settle down. After that, the program resets the flip-flop and reads the mode select switch. This sends it to one of three routines called 'one', 'two' and 'three1'.

Routine 1 is the Immediate mode, which sounds the alarm as soon as any sound is detected. You might want to use this if baby is sick. The Stamp reads the flip-flop output continuously and, as soon as it goes high, jumps to the alarm routine. There is no way back from this; it loops round a circle of commands, producing five short beeps every 20 seconds until you go to the nursery, attend to baby and reset the program.

Routine 2 is the Normal mode, which waits until a specified number of sounds have been detected during a specified period. Subroutine Record waits in a loop while word w0 counts up from 1 to 6000 (this takes about 75 seconds). If a sound sets the flip-flop during this period, b2 is set to '1'. Otherwise it remains '0'. The subroutine adds the latest value of b2 to the values in the other registers b3 to b9, and so obtains (in b10) the number of sounds detected during the previous 10 minutes.

If you want a shorter period, reduce the number of repetitions of the loop (for example 'for w0=1 to 2000'). If the number

Fig.3: *Program Listing*

```
'baby3
high 7
pause 1000
low 7
sleep 120
high 0
low 0
b0=pins & 28
if b0=16 then three1
if b0=8 then two
one:
high 0
low 0
pause 2
b0=pin1
if b0=0 then one
goto alarm
two:
gosub record
if b10>3 then alarm
gosub shift
goto two
three1:
b11=0
three2:
gosub record
if b10>2 then alarm
if b10>0 then skip1
b11=b11+1
skip1:
if b10=0 then skip2
b11=0
skip2:
if b11=20 then OK
continue:
gosub shift
goto three2
alarm:
for b0=1 to 5
high 7
pause 200
low 7
pause 200
next
sleep 20
goto alarm
record:
high 0
low 0
for w0=1 to 6000
b2=pin1
next
b10=b2+b3+b4+b5+b6+b7+b8+b9
return
shift:
b9=b8:b8=b7:b7=b6
b6=b5:b5=b4:b4=b3:b3=b2
return
OK:
for b11=1 to 3
high 7
pause 50
low 7
pause 100
high 7
pause 300
low 7
pause 100
next
b11=0
goto continue
```

returned in b10 exceeds 3 (more than three sounds during the last 10 minutes), there is a jump to the alarm routine and the action (for the program and you) is as before.

You can alter the 'if b10>3' line to another value if you prefer. If the number of sounds has not reached the triggering limit, the values in B2 to B9 are shifted along, so that the value currently in b9 is lost (a sound made 10 minutes ago is 'forgotten', and b2 is copied to b3, ready to put a new value into b2 the next time round).

Routine 3 is the OK mode. It has the same alarm-triggering features as the Normal mode, but takes a more positive viewpoint by letting you know if baby is sleeping calmly. Information about this is stored in b11, which is set to zero at the beginning of the routine.

In our version of the routine we trigger the alarm after two sounds, but you can use three as before or any other number. Each time round the routine, b11 is incremented by 1 if no sounds have been detected; if a sound has been detected, b11 is reset to 0. When b11 reaches 20 (meaning 25 minutes without a sound) the bleeper makes a reassuring 'de-dah-de-dah-de-dah' signal, but only once. After resetting b11 to 0, the program continues monitoring sounds as before.

PARTS LIST

Resistors
(All 5%, 0.25W)

R1	330 ohm
R2-4, R9	10k
R5	100 ohm
R6	4.7M
R7, 8	1k
VR1	2M trimpot
VR2	1M trimpot

Capacitors

C1	1nF greencap

Semiconductors

LED1, 2	LED, red
D1, 2	1N4148 silicon diode
IC1	4001 CMOS quad 2-input NOR gate
IC2	TL081C JFET op-amp
Q1	VN10KM or similar N-channel MOSFET

Miscellaneous

Stamp BS1 (or Counterfeit) module, with software and programming lead.	
MIC1	Crystal mic insert or other crystal microphone
SW1	Pushbutton switch (PCB mount SPST momentary)
SW2	Miniature PCB mount DP3T slide switch (or rotary)
SKT1	Three-pin header, straight (buy 40-pin and cut to length)
SKT2	14-pin header sockets (buy 40-pin and cut to length)

Piezo audible warning device, PCB mount, 3-16V DC, 75mm pin spacing; 14-pin DIL socket; 16-pin DIL socket; single core shielded audio cable; stripboard 40mm x 81mm (15 strips x 31 holes), and approx 28mm x 40mm (11 strips x 15 holes); 12 x 1mm terminal pins; plastic enclosures for main unit and monitor; Battery clip/battery box/mains plug-pack.

NOTE: The BASIC Stamp BS1 and Counterfeit modules are both available from MicroZed Computers, of PO Box 634, Armidale NSW 2350. Phone (067) 72 2777 or fax (067) 72 8987. Their Web site is at **http://www.microzed.com.au/~microzed**, or you can e-mail them at **bob@microzed.com.au**.

Operating it

The operation of the Intelligent Baby Minder is really very straightforward, and can be summarised in four steps:

1. Switch on, listen for the initial one-second beep, and select the mode you want.
2. Put baby in cot, press reset button, leave the nursery.
3. A five-fold beep (and flash) repeated every 20 seconds indicates that baby needs attention. When baby has been re-settled again, press the reset button to re-start the program.
4. If you are using OK mode, a 'de-dah' beep (and flash) tells you that baby is peacefully asleep. Enjoy the TV and pizza! ❖

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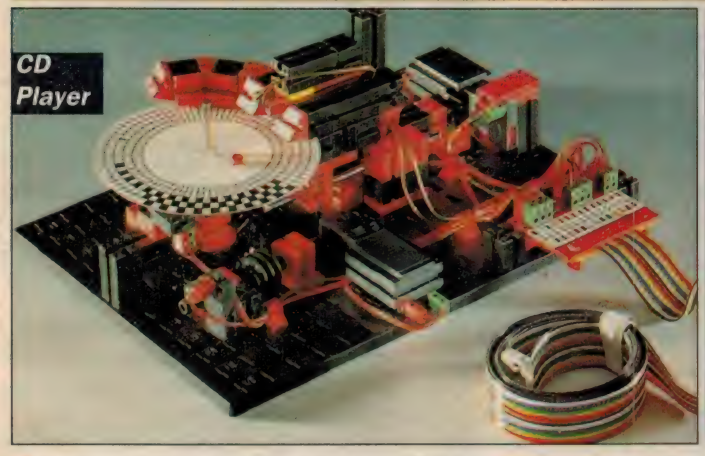

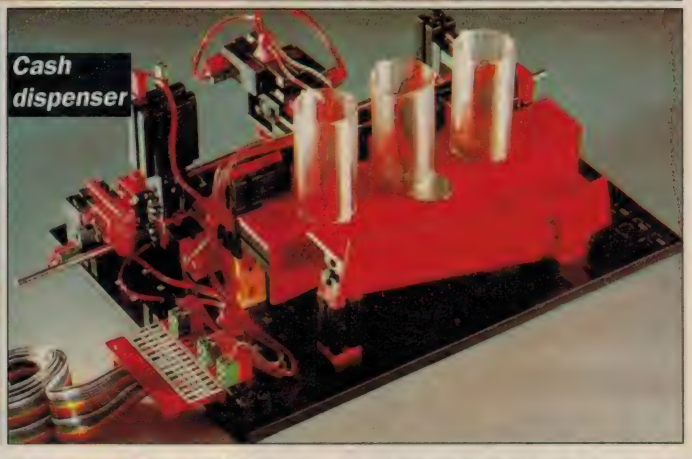

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Moffat's Madhouse

Grrrrrrid-Lock: Can electronics help?

Traffic jams! Aren'tya sickathem? Everywhere you go nowadays, you seem to be not going at all, but sitting there in your car waiting to move forward a few metres. Or when you do move, it can get downright scary.

My home, nowadays in Port Townsend, Washington, shouldn't have traffic jams, because its population is only 8000 people. As well, Port Townsend is at the end of the road; it's not on the way to anywhere, because it's located on a peninsula and is surrounded on three sides by the sea. So traffic goes to Port Townsend, stops, turns around, and goes away again.

The cars per unit of road are not many — but still, everything is slow. For one thing, speed limits are ridiculously slow — such as 40km/h along a big wide highway that would be 80km/h in Australia. Add to this the town's large population of senior citizens, and suddenly things are moving very slowly indeed.

There are categories into which drivers may be placed, in descending order of speed of travel (please pardon lapses of political correctness here...):

0: A normal, uninhibited driver. (See photo, a sign on my own car...)

1: The driver of a large American sedan — Buick, Oldsmobile, etc.

2: Sedan driver with headlights on in the daytime, for 'safety'.

3: Sedan with lights on, driven by an old man wearing a hat.

4: As in 3, with wife in back seat.

There are further categories of course, specific to Australia:

5: Car displaying bowling hat on back parcel shelf.

6: Car driven by old lady wearing bowling hat.

7: Car with four old ladies wearing bowling hats.

8: A hearse.

Seattle, Washington (not far from my home) has what's considered the worst traffic for a city its size in the USA. Like so many American cities, Seattle is blessed (or plagued, depending on your point of view) with freeways, part of the interstate highway system. And these might not be free much longer...

These super-roads bisect many cities up and down, left and right. In Seattle's case Interstate 5 (I-5) runs north and south along the city's backbone. About midway along, I-90 runs east and west. Another freeway known as 405 runs through Seattle diagonally. These roads are sources of great frustration, and sometimes great adventure.

During non-peak times, there is plenty of traffic, but it flows freely — very freely. There is a speed limit of 100km/h, which means everybody goes at 140, except when there is a cop around. The freeways carry anything up to five lanes in each direction, and they are filled with semitrailers as well as cars.

> "If the truck on your left decides he wants to be in your lane... your job is to apply the brakes in such a way as to be out of his way when he begins to occupy your space — while not being rear ended by the semi behind you."

So sometimes you're barreling along with the flow of traffic, with one semi behind you, one in front and one on each side, all moving as a mass at 140km/h. If the truck at your left decides he wants to be in your lane, he will signal, blast his air horn, and then begin merging right. Your job is to apply the brakes in such a way as to be out of his way when he begins to occupy your space — while not being rear-ended by the semi behind you.

For us country bumpkins, a trip to the big smoke is a trying time indeed. Imagine what it's like then, when the above-described mass of moving metal comes upon a Type 3 driver chugging along in the centre lane at 50km/h. That's Seattle traffic, and there are many prangs every day, all dutifully announced on radio traffic reports by overhead aircraft.

Most of my trips to Seattle have been to pick up or drop off someone at the airport. This involves a trip of more than 160km, along both shores of Puget Sound. To be sure of getting to the airport by the required time, one must allow three hours, although a really good run can take only half that.

Along the west side (my side), it's usually fairly easy sailing until you get to the place where you actually cross Puget Sound — the Tacoma Narrows. Here there's a big suspension bridge which is world famous because of some film of it taken during a storm. The wind got the whole bridge vibrating at its resonant frequency, and the film showed it twisting violently back and forth, merrily tossing cars about.

The bridge has been redesigned now, with its resonance damped. But it's still fun to collect some new arrival at the airport, and then when exactly the right moment comes, you say, "Remember that TV film of a bridge twisting and bucking? Well, you're sitting right in the middle of it!"

There are still people living in the Seattle area who to this very day refuse to go anywhere near the Tacoma Narrows bridge — they take the ferries instead, at great expense and at risk of late arrival due to overcrowding.

I mention the Tacoma Narrows bridge because it is the traffic jam champion of the Pacific Northwest. The bridge has two lanes in each direction; you'd think that would be enough. But when traffic hits that bridge it slows to a fraction of normal speed. Maybe that's because drivers are afraid of starting it shaking again.

Once cars are on the other side they start moving properly again. But for cars on the input end of the bridge, traffic comes to a start/stop standstill, and in peak hour this can extend up to 20km each side of the bridge. And if there's a prang on the bridge — ooohh! That's why you have to allow three hours to get to the airport.

These are big problems for traffic planners.

There's already a scheme to build a second bridge next to the Tacoma Narrows bridge, or perhaps a second deck on the main bridge, to ease traffic flow. But the roads feeding into each end of the bridge are two lanes each way; the bridge itself has two lanes each way. How is doubling the lanes across the bridge going to make any difference? If drivers are still afraid of the thing collapsing, they will still go slow. And the current plan is to slap a toll on the bridge to pay for its expansion, making it just as expensive to use the bridge as to take the ferries.

Now traffic planners are starting to realize that traffic congestion can't be solved by simply building more roads, because traffic always seems to increase to fill whatever roads are available. Instead they are starting to find ways to make the most efficient use of what's already there.

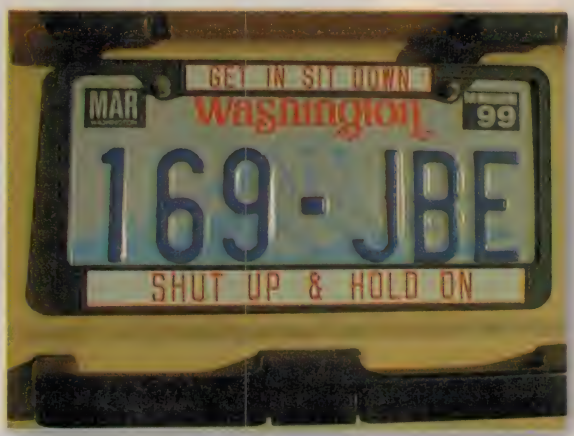
Traffic authorities in Seattle, and some other cities, are already using lanes called 'HOV' lanes (high occupancy vehicle) on I-5. These are usually the innermost lanes, set aside for cars with at least two people in them, and buses. At the same time, trucks may be limited to the two outside lanes, so the speed of traffic follows a gradient from the outside to the inside lanes.

However, since most cars particularly at peak hour contain only the driver, the HOV lanes are badly underused and therefore not really efficient. But the going is certainly good for those who DO use the HOV lanes, except for one stretch of I-5 where the HOV lane has two wheels on concrete, and the other two wheels on bitumen. It's a strange, and worrying, way to travel.

Now clever traffic engineers are working out ways to make more efficient use of HOV lanes. This involves declaring HOT (high occupancy toll) lanes. the idea is to let multi-person cars use the lanes as normal, but also allow solo drivers to use the lanes — at a price. A toll will be charged, low enough to encourage efficient filling of the fast lanes, but high enough to keep them from getting jammed.

The idea is to keep a fairly constant flow going in the HOT lanes, regardless of whether or not it is peak hour. So it's intended to vary the HOT lane toll dynamically, depending on the time of day and measured traffic volume. The problem is that you can't very well stop every car to collect the toll; that would produce more, rather than less, congestion.

So — electronics to the rescue! Every driver who intends to use the express lanes will be set up with a special account. His car will be equipped with a small transponder which sticks to their windscreen with Velcro. As a driver approaches the start of an express lane, there will be an electronic sign advising the current price. This might vary from $1.50 when the lanes are wide open, up to $4.00 at peak hour. As the car progresses along the express lane, radio equipment interrogates the transponder, taking note of its account number. Then the toll can be automatically extracted from the driver's Visa or MasterCard.



Tom emailed us this pic of his current car's number plate, with its surround message neatly summarising his feeling about driving conditions...

This system is already being used in San Diego, California, from the beginning of April this year. When transponders came on the market, the initial 1600 were snapped up in the first week. Now there are more than 2500 in use, and that number is expected to double before long.

Knowing the capabilities of the electronics in this system, it's possible to think of some further refinements. If each transponder were interrogated, say every kilometre, and if there were frequent electronic signs, then you could encourage drivers to move in and out of the express lanes at will.

If congestion in the express lane becomes too heavy, you could raise the toll by fifty cents or so, displaying it on the electronic signs. A certain proportion of drivers would decide it wasn't worth it and move to slower lanes. Then the transponder would disappear from that lane, and toll charging would stop. If express-lane traffic decreased, the toll could be lowered and cheapskate drivers would move back into the express lane.

Since transponders would be interrogated periodically, it shouldn't be too difficult to measure the amount of time drivers spend in the express lanes and charge accordingly. If they're paying by the minute, it would encourage everyone to go the speed limit instead of dawdling. And, if someone was speeding, the system could compare time versus distance covered and whack him with a mail-order speeding ticket.

This dynamic-pricing system sounds attractive, but in practice, how much congestion could it actually relieve? According to John Semmens of the Arizona Department of Transportation, you'd have to convert the entire road system onto dynamic pricing. But if that could be achieved, overall congestion could be reduced by 10%, fifty times as much as a light-rail system might eliminate. And it would be 140 times as cost-effective as rail, says Semmens.

There are, of course, social concerns here. It's felt that the system would discriminate against less well-to-do drivers who could not afford the tolls (they're calling the new express lanes 'Lexus Lanes'). But even then, less prosperous drivers would still benefit from less congestion in the 'Peon Lanes' as the Lexi moved into the express lanes.

Is this plan useful in Australia? That's hard to say. I've seen some whopper traffic jams in Oz, especially when I was living in Melbourne. But they don't hold a candle to the horror that happens daily in Seattle....

Still, this might give you some ideas to discuss with your local politician as you sit there tapping your toe, waiting for traffic to start moving again. ❖

ALTRONICS COMPONENTS

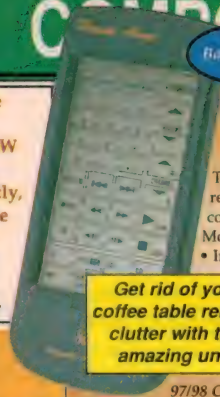
ALTRONICS Fax Order Line: (08) 9328 3487

You will be amazed with the incredible realism of your favourite music tracks with these fantastic *C 3300* D.I.Y. Home Theatre Loudspeaker Kits! This month we have also introduced a new 70W IRODA GAS Irons PLUS the new feature packed *A 1200* Bike Computer has just arrived! I urge you to place your order promptly, as many of the items are in high demand and will not last at these prices. Remember our *EXPRESS JET SERVICE* will deliver your order FAST!

(Country areas please allow an additional 24-48 hours)

Best Regards,
Jack O'Donnell, Managing Director

Learning IR Remote Control



This *learning* remote control can replace up to eight remote controls! *Featuring:* • 8 Appliance Modes • 2 Auxiliary Modes • Intelligent Backlighting - Once Activated, dims away after being idle for 5 seconds, saving batteries! *(Unlike others on the market)* Requires 4 x AAA batteries (supplied). *See 97/98 Cat. p170*

Get rid of your coffee table remote clutter with this amazing unit!

A 1000 Normally $199, NOW **$169**

Hi-Fi & Home Theatre Loudspeaker Kit

"They sound great with any music from classic to rock, from Mozart to Metallica."
Leo Simpson, Silicon Chip Magazine

Exclusive to Altronics and Dealers!

NEW!! As featured in Silicon Chip August 1998 issue!

Designed by acclaimed Australian loudspeaker designer Richard Priddle, these speakers are engineered to deliver superb sound quality whilst being incredibly simple to assemble.

• **Enclosures.** The cabinets are precision crafted on CNC machinery from high quality MDF material, and feature a new and simple construction method which provides incredible joint integrity. Each panel is cut with close-tolerance precision to ensure the enclosures fit together as designed, without leaving unsightly overhangs, leaking air gaps or mis-matched veneer. All driver, port and terminal holes are pre-cut and recessed. Speaker grille is pre-covered in acoustic cloth ready to fit.

• **Drivers.** The loudspeakers feature our new series of polypropylene hi-fi drivers, exclusive to Altronics in Australia. The 6.5" woofers produce deep, punchy bass and maintain their response through the mid-frequencies to provide a linearity of response most two-way systems cannot hope to reproduce. The fabric dome tweeter handles the most demanding of top-end program with ease, producing crisp, clean highs and exquisite detail.

• **Crossovers.** The crossover has been computer-optimised to deliver the best sound quality when coupled with these drivers and enclosure. It uses high quality capacitors and low-impedance inductors to minimise signal colouration and phase-error.

• **Kit Components.** The kit includes flat-packed cabinets, drivers, crossover components, terminals, speaker wire, port tube, acoustic wadding and detailed assembly instructions. In fact, all you need except a bottle of PVA adhesive.

FEATURES: • No electronics expertise required. Simple step-by-step assembly instructions included. • No special tools required, all sections are pre-cut and machined. Typical assembly time 2 to 3 hours. • Fully pre-assembled 2nd order, impedance matched crossover.

• Everything supplied, all you will need is PVA adhesive.

C 3300 Complete Kit **$599** plus delivery

CA3300 Kit(Less Cabinet) **$339** plus delivery

CB3300 Cabinets Only **$299** plus delivery

Delivery Fee of $25 applies to C 3300 and $12.50 applies to CA3300 & CB3300

"Virtually anyone can construct these speakers, whether they have wood-working skills or not. No special tools are required, although you will need a bottle of PVA glue. Once assembled, you will have a set of speakers you can really be proud of. In my opinion, these are comparable to speaker systems costing $1000 or more. **In fact, they look and sound so good, your friends will not believe you built them yourself.**"
Leo Simpson, Silicon Chip Magazine

Micro Jet Blow Torch

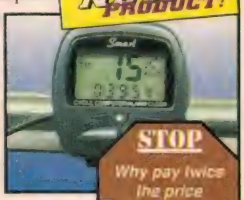
Powered by a refillable gas lighter (supplied), this blow torch burns at 1300°C, making it ideal for all types of brazing and heavy duty soldering. It can be ignited and used with one hand, and the in-built piezo electronic ignition ensures easy lighting every time. Ideal for the workshop, tool box, work bench etc.

T 2447 200g Gas Refill $4.95

T 2490 WAS $24.95, NOW **$19.95**

LCD Bike Computer

NEW PRODUCT!



This compact bike computer is a must for serious cyclists! It has all the standard features you'd expect PLUS for added security you can simply detach it from the bike and put it in your pocket once you stop! *Features:* • Current Speed • Average Speed • Maximum Speed • Trip Time • Trip Distance • Total Distance (Odometer) • 24Hr Clock Time • Countdown Timer • Countdown Distance. Supplied with mounting brackets, magnetic pickup, spoke magnet, even the battery! **(Valued at $3.95)**

A 1200 Normally $37.95 NOW **$29.95**

Gas Powered Soldering Irons

NEW PRODUCT!

The advanced *IRODA* Soldering Iron offers go-anywhere soldering convenience. It features a thumbwheel heat control, cap mounted igniter, long life catalyst tips and a huge gas reservoir for long use-time. The kit consists of the *IRODA* Gas Soldering Iron supplied in a handy carry case with a range of tips and accessories.

Features: • See-through gas chamber • Igniter built into cap • Uses standard butane gas • Supplied with safety stand, cleaning sponge, solder dispenser, blow torch, hot air blower and hot knife cutter

T 2592 Complete Kit with Accessories, will retail for $89.95
SPECIAL INTRODUCTORY PRICE ONLY **$69.95**

T 2590 Gas Iron plus Blow Torch Tip, will retail for $49.95
SPECIAL INTRODUCTORY PRICE ONLY **$39.95**

SUPER BONUS OFFER! *The first 100 callers to purchase either a T 2592 or T 2590 qualify for our FREE bonus offer of a roll of T 1100A solder and a T 2447 Butane Refill, together valued at $12.95 ABSOLUTELY FREE!*

Laser Pointers

1/2 Price!!

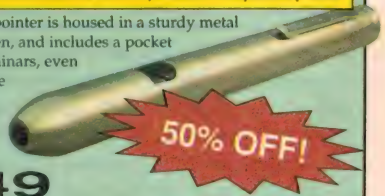
Keychain Model. This laser pointer weighs only 45g, with batteries, and comes complete with a keychain. Measuring only 61mm long by 14mm in diameter, it's not much bigger than many keys! It emits a very intense beam that can travel up to 50m, and projects a bright red dot onto the target is it aimed at. It's ideal for lectures, guided tours, seminars, building sites etc, and it's much less intrusive than a normal stick pointer! Uses two button batteries (included).

A 0201 Normally $69, NOW ONLY **$35**

WARNING ON HIGH INTENSITY LASER POINTERS

Whereas we are unaware of any of our customers (being principally engineers and electronic enthusiasts) irresponsibly using laser products, pointing towards the eye of any human or animal could cause eye damage and lead to criminal charges. Altronics is limiting the power output rating of all new stocks to 1mW. Current stocks (approx. 3mW) are not available to persons under 18 years of age and are sold on the strict understanding they will not be left where they could fall into the hands of juveniles or irresponsible persons.

Pen Model. This stylish slimline laser pointer is housed in a sturdy metal case about the same size as a fountain pen, and includes a pocket clip. Ideal for lectures, guided tours, seminars, even building sites, and its much less intrusive than a normal stick pointer! Push-to-activate operation. Uses two AAA cells (included!). *Supplied with soft leatherette storage case.*



A 0200 Normally $99, NOW **$49**

1-800 999 007 PERTH (08) 9328 1599

Doc.MS795

OVERNIGHT DELIVERY

Central Door Locking Kit

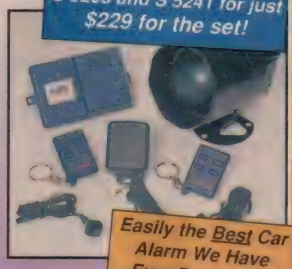
SELLOUT! Limited Stock, Be Quick! (Not available from dealers)

All four doors will automatically lock or unlock with the operation of either of the front doors. Add the ease and convenience of central locking to your car. Can be interfaced to our S 5205 car alarm (and others) to lock or unlock all four doors when the alarm is remotely armed or disarmed. Kit includes everything you need to fit central power locking to your vehicle; module, solenoids, rods & couplers, grommets, punched strip, screws & clip nuts, even the wiring harness! The actuators are motorised with an inbuilt gearbox to ensure reliable and positive operation. One actuator is mounted inside each door. Includes central control unit which mounts under the car dash. For use with 12V negative earth systems.

S 5241 Normally $119 ea, NOW A CRAZY **$69**

TITAN Remote Car Alarm

SPECIAL OFFER Purchase both the S 5205 and S 5241 for just $229 for the set!



Easily the Best Car Alarm We Have Ever Evaluated!

Don't let car thieves make off with your pride and joy, install one of these security systems and save $$$ on comparable units.

Secure your vehicle with this versatile *TITAN* car security system.System kit includes alarm module, two remote controls, battery backup siren, shock sensor, valet switch, status LED, wiring harness and hardware. *Features:* • Two remote controls • Super Loud 127dB siren • Remote panic • Battery backup and tamper proof siren • Child proofing and anti intrusion alert while driving • User selectable exit delay and auto re-arming • User selectable arming/disarming chirp • Starter kill • Valet mode • Automatic shunt of defective entry zone • Alarm memory indicates which zone (1-3) triggered • 60 second siren with auto reset • Two colour LED indicator • Can be interfaced with central locking (where fitted) • 3 extra channels on remote to control features such as boot release, etc.

S 5205 Normally $229, NOW **$169**

Desoldering Tool

Easily desolders a 14pin IC in around 30 seconds. Once desoldered, the component virtually falls out!

The T 1280 MICRON SURE SHOT Desoldering Tool makes it a breeze to remove components from any PCB, even double sided, through-hole plated boards. All it needs is a squeeze or two on the trigger and the component virtually falls out. **Features:** • Totally self contained • Light and compact • Anti static tip • Safe & easy to use • Simple to clean and maintain • Variable tip temperature.

Ideal for service techs, manufacturers, R&D centres, enthusiasts.

T 1280 Was $349 NOW ONLY **$299**

T 1282 1.0mm Replacement Tip **$4.95**

T 1283 1.6mm Replacement Tip **$4.95**

FREE!! The first 50 callers to purchase a T 1280 receive a T 1274 Bench Stand, valued at $24.95

30W Variable Temp Soldering Iron

Supplied with long-lasting iron clad tip!

Tip temperature is adjustable from 250°C to 450°C. Select the right temperature for the job and avoid heat damage to sensitive devices! Features ceramic heating element and supplied with 1.6mm conical tip. 3 other tip sizes available. **See 1997/98 Catalogue p111.**

T 2446 Normally $55, NOW **$49**

INCREDIBLE $30 BONUS DEAL! Receive a T 1100A 200g solder roll, a T 1310 Iron stand *AND* a T 1450 PCB Stand, together valued at **over $30**. ***FREE*** with every T 2446!

BE QUICK! Limited to First 50 Callers Only!

Micron Soldering Station

AS USED BY MANUFACTURERS AROUND AUSTRALIA!

Electronic Temperature Controlled Soldering Station

The ultimate in controlled temperature hand soldering for hobbyist and professional applications. Features • **Huge 60 watt heavy duty element** • Dial up temperature control with ±1°C stability at idle • Temperature range 250°C to 450°C • Ceramic heater element with embedded thermocouple for ultra-fast heat recovery • Zero voltage switching to minimise voltage spikes at tip • Low voltage element for added safety • Built in sponge tray with tip cleaning sponge • Full range of replacement long-life tips available • CMOS-safe grounded tip

T 2441 Normally $199, NOW **$129**

Save a MASSIVE $70! Features ceramic element with embedded thermo couple for ultra-fast heat recovery. Ideal for the hobbyist or professional!

UpTeK Professional Digital Multimeters

Altronics has been appointed Australian distributor for this fine range of UpTeK digital multimeters. These superb meters are ideal for the hobbyist and professional alike. All feature UL approved fuse protection on current inputs, large high contrast 3.5 digit LCD displays, high quality instrument leads, built-in stand and rugged construction. If you want the best performing multimeter for your dollar, then look no further than these excellent instruments. All are supplied with high quality, silicon rubber insulated instrument test leads.

3 Year Warranty!

43 Range LCR DMM

- 20MHz Frequency Counter
- Incorrect Lead Socket Beeper
- Peak Hold & Data Hold
- Auto Power Off
- Inductance < 2mH - 20H
- Capacitance < 20nF - 2000µF
- Frequency < 2kHz - 20MHz
- AC Volts < 200mV - 750V
- DC Volts < 200mV - 1000V
- Resistance < 200Ω - 20MΩ
- Continuity Buzzer
- AC/DC Current < 200µA - 10A
- TTL/CMOS Logic Tester
- Diode Check

Q 1108 **$139**

Auto Ranging DMM

- 32 Segment Bar Graph
- Manual Override of Auto-ranging
- Incorrect Lead Socket Beeper
- Range Hold & Data Hold
- Auto Power Off
- AC < 320mV - 750V
- DC Volts < 320mV -1000VDC
- Resistance < 320Ω - 30MΩ
- Continuity Buzzer
- AC/DC Current < 320µA - 10A
- TTL/CMOS Logic Tester
- Diode Check

Q 1104 **$119**

30 Range DMM

- Temperature -50°C to 1100°C
- Data Hold
- Auto Power Off
- AC Volts < 200mV - 750V
- DC Volts < 200mV - 1000V
- Resistance < 200Ω - 20MΩ
- Continuity Buzzer
- AC/DC Current < 200µA - 10A
- Diode Check

Q 1102 **$109**

Q 1103 Thermocouple **$15**

TRUE RMS 34 Range DMM

- True RMS AC measurement to 5kHz
- Frequency Counter < 2kHz - 20MHz
- Data Hold
- Auto Power Off
- Low Ohms Capability (< 20Ω)
- Zero Adjust on Low Ohms
- AC < 200mV - 750V
- DC Volts < 200mV - 1000VDC
- Resistance < 20Ω - 20MΩ
- Continuity Buzzer
- AC/DC Current < 200µA - 10A

Q 1106 **$119**

BONUS THIS MONTH! Purchase any one of these excellent digital multimeters, and receive a shock-proof rubber carry holster (Q 1115), valued at $12.95, absolutely ***FREE!!***

6 Input Stereo Mixer

Fantastic for dubbing home or holiday videos, mixing mics for karaoke, small PA systems etc.

Great for dubbing videos, multimedia, or as a basic PA mixer. Two 6.35mm mic inputs, two RCA stereo line inputs, and two RCA stereo phono inputs. Assignable headphone monitor, LED output level indicators and two stereo outputs.

A 2540 1998 Price $149, NOW **$99**

NiCad Batteries

GOOD FOR 100'S OF RECHARGES!!

NiCads will eventually pay for themselves, and can provide hundreds of recharges if cycled periodically. They can be used in just about any battery powered appliance.

HUGE SAVINGS!

S 4705 700mAh AA Cell Normally $2.50 ea, NOW **$2** ea, 10 & up, or **$1.60** ea, 25 &up

S 4710 1500mAh C Cell Normally $4.95 ea, NOW **$4** ea, 4 and up, or **$3.50** ea, 10 & up

S 4715 1500mAh D Cell Normally $7.25 ea, NOW **$4** ea, 4 and up, or **$3.75** ea, 10 & up

S 4720 100mAh 9V Cell Normally $12.95 ea, NOW **$8** ea, 2 and up, or **$7.50** ea, 4 & up

ALTRONICS Fax Order Line: (08) 9328 3487

1-8 PERTH (08) 9328 1599

Doc MS795

ALTRONICS COMPONENTS

Order Fax (08) 9328 3497

CLASS A Audio Amplifier Kit

(See Sc July '98) This kit is a must for any serious Audiophiles who demand a highly accurate reproduction of their favourite music. Class A amplifiers typically have peak distortion less than twice the average distortion of class AB amplifiers, figures that are almost unmeasurable (typically in the order of 0.0005%). *Specifications:* • Signal to noise ratio of -115dB (un-weighted) and - 119dB (A-weighted) • 15W rms into 8 Ω • No Crossover Distortion at low power

K 5109 **$49** H 0545 Heatsink to suit **$23.95**

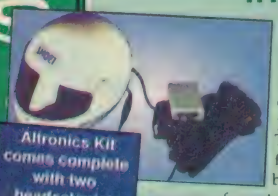
K 5110 Regulated Power Supply to suit $26.95

Video Fader Kit

(See EA April '98) Got some home videos you'd like to edit properly for keeps? This useful kit allows you to add basic professional video effects such as horizontal and vertical wipes, fade ins and fade outs during your editing. *Features:* • Wipes horizontal and vertical • Fade or wipe to black or white • Supports both BNC or RCA inputs • Built-in switchable signal enhancer so you'll maintain a high picture quality during the process. You'll be surprised just how professional-looking your results can be simply by using this very easy to build kit! Powered by 12VDC plugpack.

K 5875 **$65** M 9660 12VDC 300mA Plugpack **$13.50**

Motorcycle Helmet Intercom Kit



(See EA July '98) Communication between the rider and pillion passenger on a motorcycle can be difficult when you are moving at 100kph. This project allows hands free communication between the rider and passenger of a motorcycle. **Features:** • Separate battery supply (4 x AA) or motorcycle system supply • Low & high pass filters to reduce vibration & wind noise through the mic • VOX on/off • Single volume control for both channels. • Supplied in an attractive case small enough to fit into a jacket pocket.

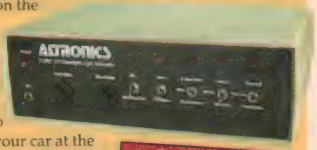
K 5270 **$45** (Helmet not supplied)

Beat Triggered Strobe Kit

(See SC Aug '98) You've seen these in Nightclubs and rock concerts. Strobes add super lighting effects in darkened entertaining area's. It is sure to add tons of life to any party or B.B.Q. *Features* • Variable rate and sensitivity for beat settings • Line source inputs for beat triggering • Selectable beat / continuous functions • Simplified construction to it's predecessor • Powered from a standard 240V mains source • MDF box, carpet, robust aluminium reflector*(unlike others on the market)* and all the necessary components for a single strobe model. Also available is a second tube option for those who need twice the light.

K 5792 **$159** K 5797 Two Tube Option **$18.95**

12V Halogen Discolight Kit



(See SC Jan/Feb '98) Based on the original Silicon chip Discolight, this unit offers the same features as the mains version only with low voltage rails , making it ideal as a school project or to add something different to your car at the next car show or auto salon! Supplied with an attractive case with pre-punched and screened front panel and parts to build and power the unit from 12V DC *(halogen lamps not supplied)*. **Features:** • 4 channels (20W or 50W halogen lamps) • Forward, reverse and auto reversing chaser patterns with music modulation • Simultaneous strobe on all channels • Alternating light patterns • 12V DC or AC operation • Input from loudspeakers, aux level or mic .

Great for car shows, sound-offs, shop displays etc! A safe, low voltage light display!

K 5807 Normally $159, NOW **$109** (Lamps not supplied)

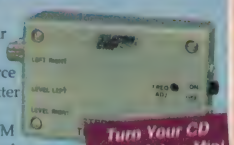
Sustain Unit Kit for Electric Guitars

(See SC Apr '98) A sustain unit can make your guitar sound a little more "live", by keeping the volume of a note at a constant level while the string resonance dies away. It's one of the most widely used guitar effects (FX), and this simple kit is a fraction of the cost of a commercial unit! It features adjustable attack and decay, a defeat switch and standard 6.35mm input/output jack sockets. Requires a 12V DC power supply. Supplied short form so you can build it into a custom case, if required.

K 5539 **$27.95**

Plugpack to suit M 9664 $14.50

FM Stereo Transmitter Kit



(See SC Oct '88) Simply connect your CD player or any other line level source to the mini transmitter which converts the audio signal to an FM signal. This FM signal can then be tuned in via any FM radio. Great for listening to your favourite CD while washing the car, mowing the lawn or doing the vacuuming etc, without blasting the neighbours.

K 1120 **$34.95**

Sound Card Preamp Kit for PCs

(See EA August '98) There are many audio analysis and monitoring software projects available over the Internet, which utilise the microphone input of your sound card. It attenuates any abnormally high signal levels to acceptable input levels to your sound card. *Features:* • 4 input levels of attenuation of +20dB to - 40dB • Presents a 1MΩ input impedance, the same as offered by a professional oscilloscope • Low ohm output impedance • Limit indicator to alert the user that the A/D converter of your sound card is in over range • Powered through the +5V outlet on the joystick port of the sound card (no plugpack required!).

K 2875 **$34.95** CRO Probe to suit Q 0175 $39.95

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Information Centre

by Peter Phillips

MOVs, battery ampere-hour rating & the Y2K issue

Our topics this month are mainly centred around batteries and the Y2K problem. For example, have you ever wondered about the ampere-hour rating of cells connected in series? We answer this and other reader enquiries, and present a method of testing MOVs (metal oxide varistors).

I'm continuing the discussion on the Y2K bug this month, with letters from readers who are actually involved in programming microcontrollers. Last month I discussed the issue from a more general aspect, reporting on the 'doom and gloom' the media typically attaches to the topic.

But what are the facts? Will aeroplanes crash? Will there be a global depression? We can't address these topics as there are too many unknowns, but we *can* look at appliances and equipment that use an embedded microcontroller.

The first letter is from a reader employed as a senior software engineer. He has had considerable experience with microcontrollers, and makes the point that cost is the driving factor on whether an appliance has a date-dependent operating system:

Your correspondent Nicholas Smith raises the question of the infamous and over-hyped Year 2000 bug as it relates to common appliances, such as a microwave oven. My first electronics job in 1986 involved designing microcontroller-based systems for white goods. With 10,000 units per year representing a low-volume run, the need for every resistor (0.7 cents each) was carefully considered, as was the need for a real-time clock (RTC).

The micros were 8048s, with 8049s for bigger jobs; no sign of an RTC, even though many products had a clock display. We implemented clocks as a software driven time-of-day counter, but without a date function, as adding date-driven code cost too much.

Therein lies the fundamental point — in the embedded micro world, cost is the main factor. If it's not absolutely necessary, we don't spend money or time on it.

Over the years I have been involved with a large number of microcontroller-based projects. Very few incorporated a 'built-in' RTC, although later micros do offer them. One of these projects included an external RTC chip, and it was thoroughly tested to the late 21st century, well beyond the expected product lifetime.

Most whitegoods, even though they commonly incorporate a time-of-day clock, don't have any date dependence. For that matter, about the only product that has date dependence is a VCR. The many micros in cars, TVs, washing machines, dishwashers, microwaves, ovens, heaters, even kettles (really!) don't know and don't care what the date is. At most they might care about the time of day.

It might be an idea to test your VCRs for Year 2000 compliance, but for everything else I wouldn't bother. My opinion is the only applications where the Year 2000 issue is really important are accounting and other financial applications, where time differences based on dates need to be calculated. (Geoff Field B.E. Grad I.E.Aust, Chelsea Heights, Vic)

Thanks Geoff, for acquainting us with the 'nuts and bolts' of appliance design and manufacture, and in particular to the aspect of cost on the design. However, while whitegoods might not be a problem, I wonder about building management systems that use a microcontroller. Are these systems date dependent?

On the other hand, I also wonder just when programmers started realising that the year 2000 was just around the corner. I would expect most programmers would have started writing code to suit 2000 at least from the start of the 1990s.

The next letter is also from a reader involved in microcontroller use and programming.

I think this Y2K thing is being blown out of all proportion, like the virus danger some years ago. At the mere suggestion that basic appliances might be affected by it, I don't know whether to laugh or cry!

For over 14 years I have been in the business of designing and programming microcontroller systems, mainly for industrial applications. I have not yet seen a microcontroller chip with an inbuilt clock-calendar function. As in a PC, if you want that function, add an external clock-calendar chip (CCC) and a battery to run it. But even then, the CCC is just a peripheral of the microcontroller; it is not in charge of proceedings. The information from the CCC is used at the discretion of the programmer who writes the microcontroller code.

While some appliances (e.g., VCR, microwave oven) incorporate a clock, it's no guarantee they have a CCC. Generally they don't retain time without mains power, so it's likely the time is derived from a mains interrupt to the microcontroller and a simple counting routine. And even if a CCC is used, I've not seen an appliance which makes use of a date function — so why would the date stop it operating?

And even on a PC, the hysteria has gone too far. I'm sure many people believe their old PC will stop when 2000 starts. Again, why would it? The CCC doesn't control the PC; DOS does. At boot-up, DOS reads the CCC time and date (with the year stored as two digits in old machines), and from then on maintains (updates) the time using its own crystal oscillator (CPU clock). So if DOS interprets the year 2000 as 1900 (or more likely as 1980), so what? DOS doesn't care what the date is.

Of course DOS's interpretation of the day of the week will be wrong, but that still won't cause the PC to crash. Apart from time/date stamping files saved to disk, DOS simply stores (and updates) the time/date information, and passes it on to programs that ask for it.

And that's where problems begin. If you can live with the fact that files stored on your disk will look as though they were stored before personal computers were widespread, and if you don't mind editing the day/dates automatically inserted by your wordprocessor (or other application), you can still continue to use the majority of your programs.

But problems will occur in programs which use the date for comparisons. Examples are accounting programs, which 'age' debts, and automatic backup programs

which make backup decisions based on the date of disk files compared with the current (system) date. Programs such as these will probably not work properly, but these are minority uses for most home users.

Sure, big institutions and companies with financial and accounting software systems will need to do something, and small business and home PC users will need to make a few checks (or test beforehand — see the BSI site below). So please, hose down the paranoia regarding domestic appliances, before my sides split!

By the way, for a technical discussion on the Y2K problem, visit the British Standards Institute (BSI) site: http://www.bsi.org.uk/bsi/disc/year2000.html. (Daniel Ford, BE, MBA, SMIREE, Managing Director, Advanced Solutions P/L, Beecroft, NSW)

Thanks for this information Daniel, and for the website address. As you and Geoff say, date-dependent microcontrollers are somewhat in the minority. And again it depends on the code written for the device, not the actual micro.

So that's a look at home appliances with a microcontroller. The message seems to be 'don't worry', at least as far as our two correspondents are concerned. Now let's see what the BSI website has to say.

BSI's Y2K website

Clearly the BSI is taking the problem seriously. There's a wealth of information on their site, including documents you can download. I looked at two different pages, and the following is an edited extract from a much longer discussion of the problem:

Only when an organisation has analysed the Y2K problem and its business risks can it have an accurate picture of the scale of the task and the time and resources needed to fix it. Unfortunately, such a picture is typically more difficult, more expensive and more draining on resources than any of their estimates. Or as Caroline Bramley put it; "The Year 2000 problem is like an onion. The more layers you peel, the more you find. The more you find, the more you cry."

This is a topic we could explore a lot more, but I think we've got the message. If you own a company that relies on computer systems, be it on your own head if you don't ensure the system is 2000 compliant. For the rest of us, check the VCR for compliance.

Lithium rechargeables

In the June issue, a reader (E. De Longis, Midvale, WA) asked about charging Panasonic VL2330 vanadium pentoxide lithium rechargeable batteries. In answer to the question, Daniel Ford (see above) has suggested the following:

I don't know how to charge these batteries, having only used Sanyo MnO2Li rechargeables, but I suggest your correspondent contacts Premier Batteries, phone (02) 9755 1845. This company seems to know almost everything about almost every type of battery in common use.

Thanks again, Daniel. These days it's almost impossible to keep track of the many types of rechargeable batteries. However, charging them is one thing — what about storing them?

Storing NiCads

The following question is one I'm sure a lot of readers might have wondered about...

My laptop computer is powered by a NiCad battery pack. However as I don't use the laptop all that often (only on trips), and bearing in mind the NiCad 'memory effect', I wonder what I should do about the battery pack. Should I regularly recharge it to keep it in its best condition, or is it OK to leave it discharged for say six months at a time? The packs seem to be fully discharged when you buy them. (Andrew Palmer, Leura NSW)

Sealed NiCads can be stored indefinitely in a discharged state, or in any state of charge without significant loss of life. Ideally they should be stored in a clean, dry environment below 50°C. There's no need to regularly charge them, although if they are left standing for a long time, you might need to charge-discharge them several times to regain their capacity. In this case, the first charge should be for a 24-hour period (instead of the usual 14), at the C10 rate (charge current one-tenth the ampere hour capacity of the battery).

The only other maintenance is to remove any crystalline growth from around the sealing. This growth is not detrimental to the battery, and can be prevented by smearing the area with silicone grease.

Now for more on the ampere hour capacity of a battery pack.

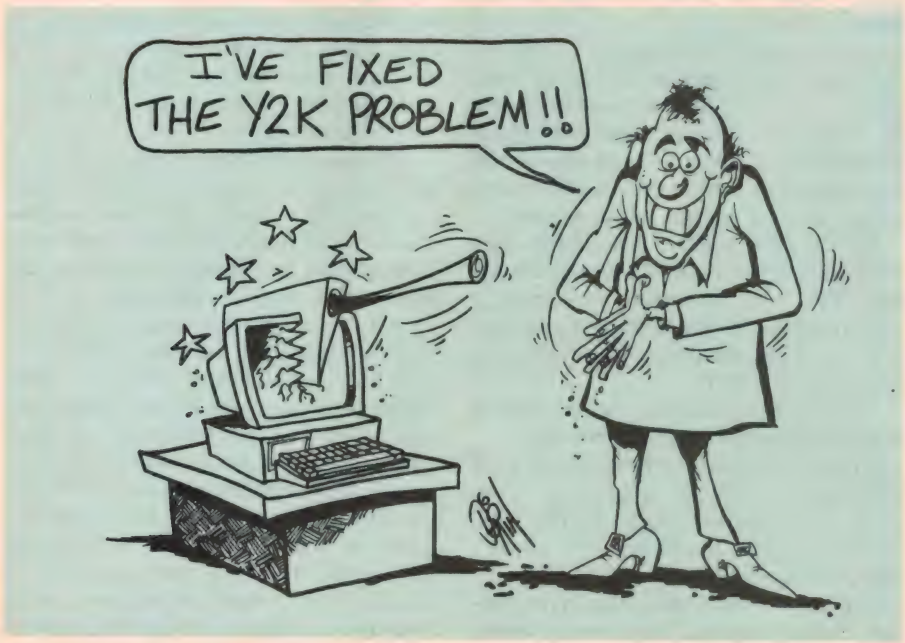
Tiny tube battery

The next letter takes me to task about my description of the battery pack in the 'Tiny Tube portable lights' described in the April and May 1998 issues.

In the tiny tube light articles, you say each NiCad cell in the battery pack has a capacity of 63mAh. You also say in the article "we made up a pack from 30 of these cells to give three 12V batteries in parallel, with a total capacity of around 1.9Ah."

If 30 cells are connected in parallel, you get a battery with a 1.9Ah capacity, but with a terminal voltage of 1.2V. If 10 of these cells are connected in series, you get a 12V battery, but with a capacity of 63mAh. Connecting three of these in parallel gives a capacity of 190mAh, not the 1.9Ah you claim.

There's further inconsistency when you say the 14-hour charge current to each



series pack is 40mA, as this implies a capacity (for 10 cells in series) of 600mAh. I would believe this if the cells were rated at 630mAh. Incidentally, the volume of these cells is around that of a 600mAh AA size NiCad. What is the reality of the situation? (Ian Darby, email)

Fair questions, Ian. First let's look at what's meant by an ampere-hour rating. Although it suggests a current rating, it is in fact an energy or capacity rating. For example, a 63mAh NiCad can deliver 6.3mA for 10 hours, or ignoring other effects, 63mA for one hour, or 630mA for one tenth of an hour. The current capability of a cell is determined by its internal resistance, which in turn depends on its construction.

When cells are connected in series or in parallel, the total stored energy is the sum of the stored energy in each cell. Now you might think that when cells are in series, because the same current is flowing through each cell, the chemical action to create the current is the same in each cell. Not so. If you connect say ten 2V cells in series, with each cell rated at 1Ah, you get a 10Ah battery with a terminal voltage of 20V. If the battery is connected across a 20-ohm resistor, a current of 1A flows. However, compared to a single cell, there's now 10 times the quantity of chemicals to produce the current. Therefore a current of 1A will flow for 10 hours.

Now to your question about charging the cells. When 10 by 63mAh cells are in series, the total capacity is 630mAh. The charge current at the C10 rate (or 14 hour rate) is therefore 63mA, which is what the circuit does (more or less). The C10 discharge (10-hour discharge time) is also 63mA. Notice there's more energy put into the battery than taken from it, due to the efficiency of the NiCads.

As for the size of the cells, I have to agree that their physical size suggests a higher ampere hour rating. However, they come from a pack of six cells (in series), with the pack rated by the manufacturer at 380mAh. Hence the 63mAh rating for each cell. My guess is the manufacturer is being very conservative about the rating. And while we're talking about the tiny tube lights:

Coax voltage rating

This letter questions the use of the coax cable used in the prototype to connect the tiny tube in the strobe-beacon light described in the May issue.

Thanks for a great project. May I suggest however that twin coax from a set of headphones is hardly a safe cable for a high voltage circuit. The circuit is labelled Caution - High Voltage, so why use a cable designed for a low voltage circuit. You wouldn't dream of using this cable in a 240V circuit, no matter how light the load. Maybe a cautionary note should be published. (A.J. Lowe, Bardon, Qld)

Yes, I admit it seems an odd choice of cable. The peak voltage across the tube is around 380V, much the same as the peak voltage from a 240V AC source. However the important difference between a 240V power outlet and the output of the tiny tube inverter is the current capability. The cable used in the prototype is thin twin coax, with each cable individually insulated with a rubber coating. The earth braid surrounding each cable is not used.

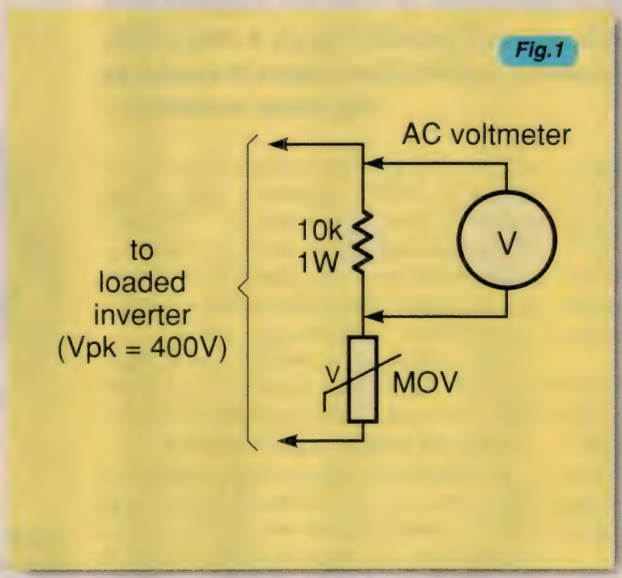


Fig.1: Suggested setup for testing a 275V MOV.

This means there's at least 0.5mm of rubber insulation between each cable. The dielectric strength of rubber is somewhere between 10 and 20 times higher than air, or around 30kV/mm. This means, at a conservative estimate, at least 15kV is needed between the cables to cause the insulation to break down.

Being a construction project, we assume readers will choose cables to suit the application of a project. If you intend using the tiny tube light in situations where the cable could be subjected to physical abuse or strain, then clearly you should use cable with heavier insulation. In normal use, this is not a problem. However, thank you Mr Lowe, for raising the point. Yes, as with any high voltage circuit, caution is essential!

MOV rating

A MOV or metal oxide varistor is often called a voltage suppressor. Although they're used extensively, cost less than $2 and are readily available, they are still an obscure device to many people. This letter asks questions about MOVs that others might have wondered about:

I use MOVs to suppress the back EMF across a relay coil. I also use them between phase and neutral to protect equipment from voltage transients. MOVs are generally given a rating in joules, which I believe means the device has a limited life based on this rating. How can I test a MOV without using an overvoltage source and a CRO? Commercial surge protectors often have an in-built alarm to indicate the device needs replacing, but I suspect this is simply a fuse-type indicator. (Kim Pederson, Port Moresby, PNG)

A typical mains-rated MOV has a voltage rating of 275V, and an energy rating of between 20 and 40J. One joule per second is a power of one watt, so a 40J device can handle 40W of power for one second. Extrapolating backwards, the same device can handle 400W for 0.1s, and 4kW for 10ms, which is the duration of half a cycle of mains power. That is, the allowable fault current for 10ms is around 14A, usually enough to blow a fuse.

Unfortunately, testing a MOV takes longer than a few seconds, which means using a test current of a few milliamps. A test method I've used is shown in Fig.1. If the MOV is working, the AC voltmeter will indicate a voltage proportional to the current flowing in the resistor. Naturally you should first make sure the MOV is not a short-circuit. I don't know of any test method that doesn't involve a suitable voltage source.

What??

This month's question comes from Jim Lawler, of Geilston Bay in Tasmania. The answer to the question can be calculated, but even trying to guess it should prove interesting. It's about the range of length measurements we need to perform.

Consider the smallest distance and the largest distance man needs to measure. What is the difference in centimetres (expressed as a power of 10) between the two?

Answer to August's What

The answer for circuit (a) is 300Ω, which is obvious as the resistors are in series. Circuit (b) also poses little difficulty, as the jumper shorts out two resistors, leaving a total resistance of 100Ω. Circuit (c) has a resistance of 33.333Ω, as although not obvious, the three resistors are in parallel. It often helps to redraw the circuit! ❖

Vintage Radio

Two Valve Sets — 1927 to the pre octal era

1927 can be regarded as the year that all-electric sets were introduced. As the rectifier was at first not counted as a 'valve', a 2/3-valve electric set was considered as a two-valver. So from 1927 on, there's plenty to talk about when it comes to 'two valve' receivers...

There are no definitive dates for the introduction of new ideas etc. Rather a date is claimed that is generally acknowledged to be when the new ideas began to penetrate the market. So, for 1927, 1928 and perhaps 1929 and 1930 as well, there were still many battery operated two-triode transformer coupled radios being built by enthusiasts.

The electric sets began to make their presence in about 1927. In the early years they were all-triode affairs, comprising usually around six stages plus a rectifier. When used with the then-new balanced amature or cone speakers, they can to this day give a reasonable acount of themselves.

Did we have battery powered all triode two-valvers capable of loudspeaker operation? There was one particular English radio, made by Kolster-Brandes Ltd and marketed in conjunction with cigarette manufacturer Godfrey Phillips. Evidently, if you collected 500 vouchers from the 10-packs of 'BDV' cigarettes, you got the radio for free! Given that in 1930 there were supposedly no ills associated with cigarette smoking, for the sum of £12/10/- you got to smoke your 5000 durries and got a free wireless. Not a bad deal, really!

This dinkie little set is illustrated in Fig.1. It is fully enclosed in a bakelite case, a 7-1/4" cube, uses rather surprisingly French 'Fotos' triodes, and requires external batteries.

In this country, the 'Crosley' model 51, a two-valver, was being offered for as little as £5/10/- complete, and was said to work a loudspeaker. An advert is shown in Fig.2. It must be stressed that by 1928 or so, many of the stations had increased their transmission power to up to 5000 watts in some cases, with many being in the 1000-2000W range. Compared with the 300 - 500W levels of two or three years earlier, the increase in transmitted power no doubt contributed to the ability of little sets such as the Crosley 51 to drive a loudspeaker.

Fig.1: The English made Kolster-Brandes two-valver of 1930 came free with 500 cigarette coupons, in an offer from the Godfrey Phillips tobacco company.

One of the locally made all triode two-valvers was the 'Astor' Electric Two of 1930, and Stromberg Carlson also released an all-triode electric model in a most pretentious cabinet, with an equally pretentious 'quarter-acre' chassis.

The Philips 2516

The Philips 2516 came pretty close to a two-triode loudspeaker radio. It is a triode regenerative detector, transformer coupled to an output stage using the new 'penthode' (as they were first called). When used with a long wire antenna and a sensitive Philips speaker, loudspeaker results were indeed possible. It must be stated that the Philips 'Sevenette' and 'PCJJ' speakers were very good for their times, and sound quite acceptable even today.

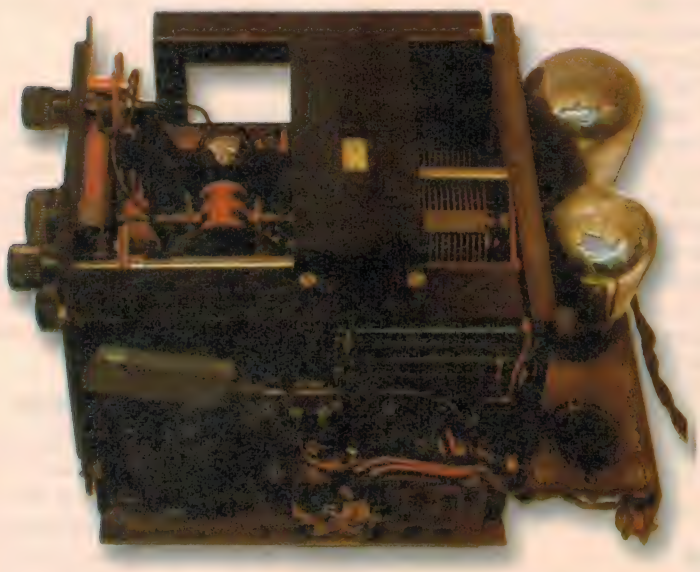


Fig.3: Inside the Philips 2516, an all-electric 'two valver'. Outside, it looked very similar to their well-known battery eliminators of the day — deceiving many would-be collectors.

The inside of a Philips 2516 is illustrated in Fig.3. The circuit holds no surprises, and consists of an E415 or similar triode, a B443 output and a 506 rectifier, all with European bases.

Unfortunately, this set has all the hallmarks of 'Philip's fillips' and is constructed in the three dimensional mode. There is a four-position antenna connection comprising a link with a moulded bakelite handle, and two rows of four sockets. Position one uses the dubious practice of using the mains cord as an antenna, in that the mains is connected to the antenna terminal of the coil via a mica capacitor of about 500pF. In the other three settings, an external antenna is connected by one of the three small value capacitors to the coil. A two-position switch selects a tuning range of either 2000-800kHz or 1100-430kHz.

Between the tuned circuit and the grid capacitor is what can only be described as a grid stopper of 350 ohms. Just what purpose it serves is debatable. (Surely it couldn't be there to prevent parasitic oscillations?)

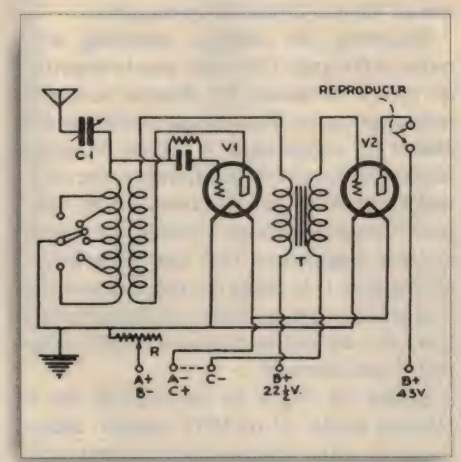
At the rear of the set are two sockets marked 'G'. These are obviously for gramophone input. One connection is direct to the grid, and the other is a point on the negative supply line at -4.7V. The combined decoupling resistor, grid leak and voltage dividing resistors present an input impedance of 2.2 megohms, across which is a bias of -4.2V. When connected to a comparatively low DC resistance magnetic pick-up, this bias will now appear at the grid of the E415, which represents about the right voltage for the anode potential of 70 volts for maximum class A operation. A very clever piece of circuitry...

The detector is of the 'leaky grid' type, and reaction is controlled by a vario-coupler. As far as the rest of the circuit is concerned, it is conventional. HT filtering is in the negative line via a two-section choke. There is decoupling just about everywhere because of the low value filter capacitors — all paper types, of only 1uF. There is no volume control.

The cabinet of this set looks rather familiar. In the early days of collecting vintage radios, these sets were known to be confused with the Philips 'B' and 'C' battery eliminators, and as a result were often overlooked at auction sales. Prudent collectors recognised them immediately, and because of the lack of interest, purchased them very cheaply indeed!

For all the unusual layout and wiring practices, the 2516 is beautifully made, is well designed, and is a good performer.

Fig.2: The Crosley model 51, a battery two-valver advertised in The Listener In for 15 Feb 1928. As you can see from the circuit below it was very basic.



'Screen grid' valves

By about 1928 the new tetrode type UY224 was released, and made its way to this country by about 1929, appearing in the contempory magazines first by way of introduction and then in illustrative circuits. A similar story applies to the Philips E442, and the battery types that first appeared such as the American UX222 (which has a 3.3V filament, incidentally), the Marconi S625 and Philips A442, and a host of other British types. Together with the newer output pentodes B443, C443, and type 247, a higher gain receiver was now possible.

The screen grid valves were unsuitable for transformer coupling. This is a characteristic of high impedance valves, be they high gain triodes or pentodes.

Particularly when using the UY224, the standard procedure was to use 'impedance coupling' (otherwise known as choke coupling), from the 224 to the output stage. Basically, the anode load resistance of usually 250k was replaced by an an iron cored choke of about 10 henrys (or greater) and having a DC resistance of perhaps only 3k or so.

This was done to overcome the problems of transformer coupling, yet still maintain a substantial anode potential by virtue of the reduced DC voltage drop across the winding. The impedance of the choke at audio frequencies, which represents the true plate load, is up around 100k ohms. The old '24A simply lost too much gain with the reduced anode voltage caused by a conventional resistor as the plate load...

With the later series of 57/2A5 or 6C6/42 combinations the problem was not so bad, and the standard form of R-C coupling was the norm.

Commercial regen sets

There are absolutely no shortage of commercial two-valve electric sets based on a regenerative detector, either in the literature or amongst collectors. Many manufacturers offered them. 'Eclipse' chassis in particular were offered under different labels for the various department stores' own brand budget priced sets. For most sets the valve combinations were a 224A driving a 47, or various Philips types such as E452 and E443H, followed by the later combinations of 57/2A5 and 6C6/42.

Properly designed, these sets could perform quite well. However, there was little point in offering a set for half the cost of a superhet that performed better than half as well as a superhet, now was there? Some of the tricks used by the manufacturers were reduced screen voltage on the detector stage, thereby reducing the stage gain, and over bias on the output stage. In this stage this had two effects; it limited the plate current and hence the power delivered to the speaker, and it reduced the sensitivity!

The coils for these sets were invariably of the solenoid type, wound on either an impregnated cardboard or bakelite former and using solid enamelled wire of about 32 SWG. Some of the very early sets used cotton covered wire. The antenna connection was either via a tap towards the earthy end of the coil, or a small coil wound on a bobbin placed inside the coil former. The aerial coil primary invariably had one or more taps. The antenna also tended to be generously coupled to the tuning circuit, making station separation of close stations very difficult — hence the choice of antenna connection. In fairness, though, in the early 1930s there simply weren't as many stations as there are today, and they were a little further apart.

Here in Adelaide, the test of a good single-tuned-circuit regenerative detector is to separate 5DN on 1323kHz and 5AA on 1397kHz. Not many of them pass the test. The only way to achieve it is to reduce the antenna coupling. However, many circuits had the volume control, which was a 1000 or 2500 ohm pot, simply shunted directly across the primary winding, with the wiper connected to earth. Removing turns from the primary then made the volume control more difficult and it also tended to dampen the tuned circuit — making tuning more difficult.

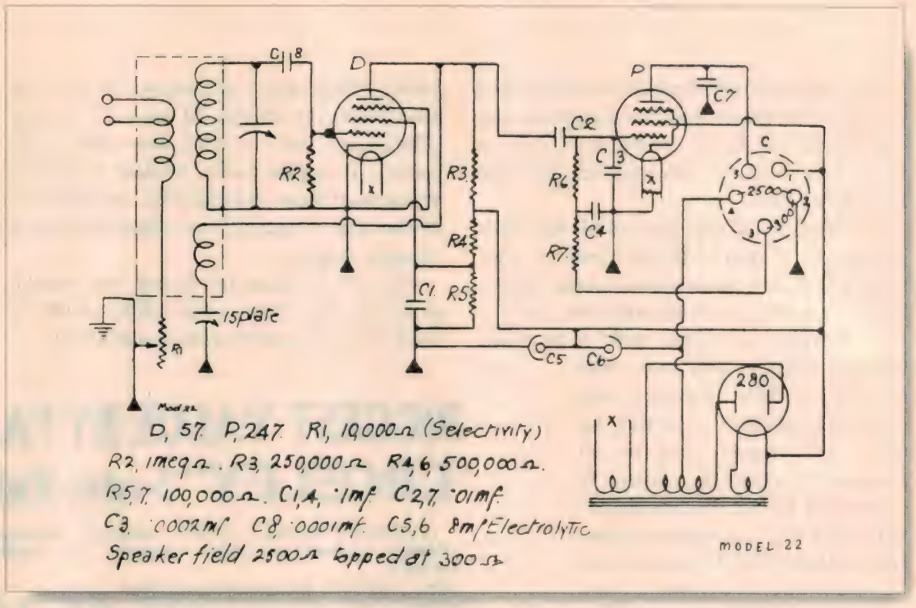


Fig.4: Very typical of the early 1930s two-valve electric sets is the Healing model 22 circuit shown here. Regenerative detector D drives output stage P directly.

In cases like this, the antenna coupling can be reduced by experimenting with a small value fixed capacitor in series with the antenna and the antenna winding of the coil. However performance at the low frequency end of the coil drops off appreciably...

Reducing the antenna coupling also reduces the gain. One sure way to improve the gain is to operate the detector screen at maximum value. This means modifying the circuit by substituting a screen dropping resistor with one that is different to the original value. Such modifications are the subject of vigorous debate between the purists and the pragmatists. One neat conscience-saving ploy is to make the receiver work in a practical manner, whilst kidding oneself that one 'can always change it back to original if one chooses'.

Shown in Fig.4 is the circuit for a Healing model 22 of 1932 vintage, which has most of the features described and nicely illustrates the piont. The screen voltage would be lower than maximum rating.

When was the rectifier considered to be a 'valve'? After all, it's only a dumb old twin diode; it doesn't really *do* anything!

Well, around the mid 1930s some slick fancy-pants salesman probably realised that since it was made of glass, you could plug it in, and it glowed in the dark like the others, then it was a valve. Suddenly, a 'two valve' set became a 'three valve' set, with all the added advantages a third valve offers. Ho hum....

Multiple valves

In the pre-octal era came the type 53 and the later 6A6 valves. Although these were designed as a class B output valve, there were hobbyist circuits that used them as a triode regenerative detector with an R-C coupled audio and thence to a pentode output. Good results were claimed.

The other multiple valve of note was the 6F7, which was originally intended as a mixer oscillator. This tube has separate pentode and triode units within the one envelope, sharing a common cathode. It was used for a variety of purposes other than its original intention.

Because of the pentode section, the 6F7 could be used as a RF amplifier and regenerative detector triode, and then R-C coupled to an output stage. Again, good results were claimed, because of the increased selectivity. ❖

'Front End' for PC Audio Recording

(Continued from page 49)

a template for drilling it too. Here the four 3mm holes only need de-burring. You might also want to solder the end of a short length of hookup wire to the copper laminate, for convenient connection to the PCB earth when they're in situ.

It should now be possible to mount the PCB assembly inside the case bottom. I used 12mm-long 3mm countersink head screws, passing through the case bottom and then through the shield plate before star lockwashers and nuts were fitted (mainly to act as short spacers for the PCB). Then, after checking that all of the component leads were trimmed short under the PCB, to prevent shorts, the PCB was fitted to the remaining screw ends and a further lockwasher and nut added to each screw to fasten it in place.

After mounting all of the controls to the front panel and the connectors to the rear panel, you're then ready for the final stage: adding all of the off-board wiring, between the PCB and the controls and connectors. This is fairly straightforward, but take it easily and carefully to avoid errors.

Note that shielded audio cable should be used for the wiring to the microphone jack and magnetic pickup input sockets, at the very least. You may also want to use this cable for the wiring to the Tape/Line input sockets, and perhaps that to SW1, RV1 and RV2 as well — to minimise susceptibility to noise and hum, etc. It's probably not necessary to shield the wiring to SW2, RV3, RV4 and the output connectors, though, as the signal levels here are higher and the impedance levels lower. There's also no need to shield the wiring to the power LED, of course.

By the way, don't forget to solder a lead to the metal bodies of each of the pots on the front panel, with its 'other end' connected to signal earth — say via the earth lead from the LED. This should ensure good earthing of the control cases and front panel, and allow them to act as a shield plate above the PCB assembly.

With this final wiring done, your Recording Front End should be just about complete. As there's no actual setting-up required, little should remain except assembly of the case, and connecting it up to your PC for a trial run.

By the way, I've discovered (largely the hard way) that there are a few tricks to getting the best results when you're using the RFE with a PC and sound card for making digital audio recordings and transcriptions. In a follow-up article, I'll try to pass on some some suggestions and helpful tips on putting it to use. ❖

Computer Clinic

Creating your own Windows program with the CGI...

Last month, after answering Mr Healy's query about Windows programming, it struck me that there is a way to create a Windows program without having to shell out for an expensive, often hard to drive, programming language. There is a way to use your own favourite DOS language, be it Pascal, C, a batch file, or (for the strong of stomach) BASIC to create a perfectly good Win95-looking app without ever having to deal with the mind-numbing ugliness of Windows system calls. What's more, you get to use an interface that's probably more widely used than any other application: the web browser! That's right, this month I'm taking you on a lightning tour through the weird world of the CGI.

Before I go any further, I'd just like to point out that this isn't the most eminently practical approach to things (or very easy to distribute), as the setup is somewhat fragile and takes a fair amount of overhead to support it. Also, the only controls you can use are radio buttons, check boxes, text boxes and drop-down lists. No menus, no message boxes and no multiple windows. It *is* fun to work with, however, and you will learn a lot about what goes on whenever you use a search engine, see a hit counter or look through a webcam.

Are you being served?

Apart from a web browser, all you need is an HTTP server. HTTP servers (also known as web servers) are the programs that make the World Wide Web possible. They pick up HTTP requests from the network and send the appropriate web page back to the computer requesting it. As well as simply sending HTML files and pictures, they have another major function that has made the web what it is today: the Common Gateway Interface (CGI).

The CGI is a mechanism that allows the server to run an external program, and send that program's output back to the user as a web page. This is how search engines work. You type your query into a form on the main page, and the web server takes the form and hands it to the search software, which spits back the results of your query, nicely formatted in HTML. The web server then sends this output back to you, making it look as though it already had a whole web page devoted to your query just sitting there.

There are lots of cheap or free HTTP server programs out there. The one I use is OmniHTTP v1.01, available from **http://www.omnicron.ab.ca/httpd/index.html**. It's small, it works, and it's free. Once you run the install program, everything is ready to go; just point your browser at http://127.0.0.1, and you should see an FTP-style directory listing. Click on Default.htm, and you should see the introduction page.

There is one minor inconvenience with Microsoft Internet Explorer 4: If you are working offline and try to access the local server, IE4 will quite unnecessarily try to connect you to your ISP. If this happens, cancel the 'Connect to:' requester, go to the File menu, deselect 'Work Offline', and try again. Netscape users don't get this problem; but then again, they have to use Netscape, which is almost as annoying.

Local hero

If you're thinking 'I can't do this, I'm not on the net', then fear not. You don't need a web site, a connection to the internet, a network card or even a modem. The clever people who designed TCP/IP (the network protocol used on the internet) reserved the IP address 127.0.0.1 as a loopback address. This means, in effect, that data requests sent to 127.0.0.1 don't go through the network card or modem, but go straight to your HTTP server instead.

If you have no connection to the internet at all, then you will need to make sure that TCP/IP is installed on your computer. To check whether you have it, go to Control panel|Network, and look at the list that appears. If you don't see TCP/IP anywhere, click Add, Protocol, Microsoft, TCP/IP, Ok. You'll be prompted to insert your Win95 CD, and to restart your computer.

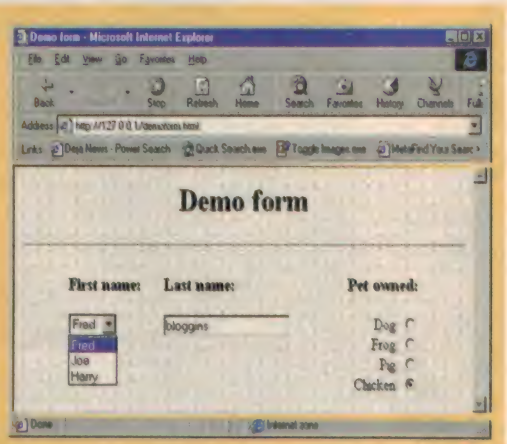
How to do it

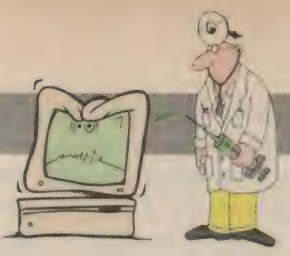
The actual implementation of CGI programming is very simple. You will need to make an HTML page, using one of the many HTML editors out there such as HoTMetaL or Microsoft FrontPage. (If you are feeling adventurous, stick with good old Notepad. You get a lot more control over the finished result, and a lot more kudos as well.)

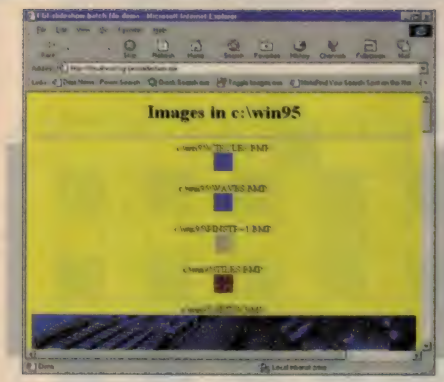
The web page should contain a hypertext link to your CGI program, either in the form of a standard <A HREF> link or a form. All you do is put your program into the CGI-BIN subdirectory of your web server's direc-

```
<HTML><HEAD><TITLE>Demo form</TITLE></HEAD>
<BODY BACKGROUND="http://127.0.0.1/images/bg.gif">
<CENTER>
<H1>Demo form</H1>
<HR>
<FORM ACTION="http://127.0.0.1/cgi-bin/someprog.pl" METHOD=GET>
   <TABLE WIDTH=80%><TR VALIGN=TOP>
   <TD><H3>First name:</h3><SELECT NAME="FirstName">
      <OPTION>Fred</OPTION>
      <OPTION>Joe</OPTION>
      <OPTION>Harry</OPTION>
   </SELECT></TD>
   <TD><H3>Last name:</H3><INPUT NAME="LastName" TYPE=TEXT></TD>
   <TD ALIGN=RIGHT><H3>Pet owned:</H3>
      Dog: <INPUT TYPE=RADIO NAME="Pet" VALUE="Dog"><BR>
      Frog: <INPUT TYPE=RADIO NAME="Pet" VALUE="Frog"><BR>
      Pig: <INPUT TYPE=RADIO NAME="Pet" VALUE="Pig"><BR>
      Chicken: <INPUT TYPE=RADIO NAME="Pet" VALUE="Chicken" CHECKED><BR>
   </TR></TABLE>
</FORM>
</CENTER>
</BODY>
</HTML>
```

Fig.1








```
@echo off
printf "Content-type: text/html"
printf ""
printf "<HTML><HEAD><TITLE>CGI slideshow batch file demo</TITLE></HEAD>"
printf "<BODY BGCOLOR=`#F0F080`>"
printf "<CENTER><H1>Images in c:\win95</H1><HR>"
for %%s in (c:\win95\*.bmp) do printf "%%s:<BR><IMG SRC=`%%s`><BR><BR>"
printf "</CENTER><HR></BODY></HTML>"
```

Fig.3

tory, and provide a link to it in your web page. Clicking the link will execute the program, which will in turn produce a new page that will display on your browser.

If the program is self-contained (i.e. it doesn't require any input from the user), you can simply link to the program as though it were another web page, for example: <A HREF="http://127.0.0.1/cgi-bin/mycgi.exe"> Run the CGI app! </A>. The program simply prints the information to its standard output, using printf(), PRINT, or however your favourite language normally produces text.

If your program needs information from the user, things get a little more complicated. You need to send the information to the program using the HTML <FORM> element (used to create check boxes, text areas, etc). The <FORM> element has two major attributes: ACTION, containing the link to the CGI program (as above), and METHOD, which controls how the information is to be sent. I'll be using METHOD=GET in this article, which puts the contents of the form into the QUERY_STRING environment variable. (The other option is METHOD=POST, which makes the form data available on the program's standard input. More flexible, but not as simple.)

A complete HTML form, then, might look something like Fig.1. The INPUT sub-elements are used to create the actual controls on the form. The TYPE and VALUE attributes define the controls' appearance, but what we're interested in the moment is the NAME attribute. When the form is submitted, the form data is encoded in name=value pairs separated by ampersands, so the form in **Fig.1** would produce **FirstName=Fred&LastName=Bloggins&Pet=Chicken**. This string can then be read by your program (using getenv() or equivalent) and the information extracted.

CGI in action

Once your program has digested the data, it needs to return the program's output to the browser in HTML format. First, though, it must tell the web server that it is sending a web page. This is done by outputting "Content-type: text/html" *and one blank line* before sending the rest of the page.

That accomplished, all it has to do is to dress the output up in HTML format. This can be as simple as sticking "<HTML><BODY>" on the front, and "</BODY></HTML>" on the end, but you can get as fancy as you like, with images, tables, more forms, or even frames if you want.

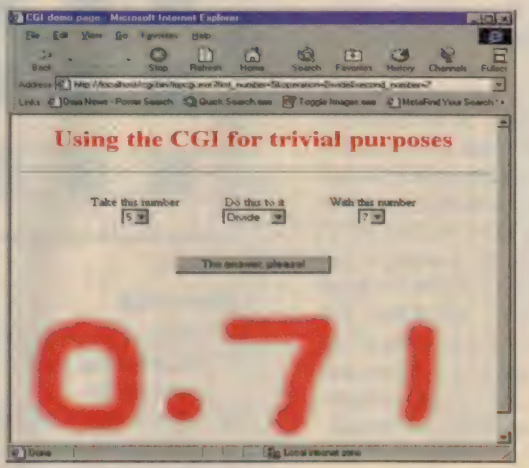


Fig.2: A very simple CGI-based program in action. It does simple maths with two selected numbers.

You can see a decidedly non-fancy example in **Fig.2**. This little program, written in C, takes two numbers, and adds, subtracts, divides or multiplies them together, and displays the result in graphical format. This is achieved by going through the result, digit by digit, and printing an HTML <IMG> tag for a GIF of that digit. (I created the images at about four in the morning, so please excuse the sloppy mousewriting.) It also prints its own calling form at the top of the page, so you can run it again without having to go back.

The hardest part of writing the whole program was the string handling for extracting the numbers from the POST string. Once that was done, everything was plain sailing. The source is a little long to print here, but it's available on the EA BBS and web site, along with the images and executable version.

Fig.3 shows another little demo that I knocked together; this one produces a simple slide show of all files in a given directory. This wouldn't be terribly interesting if it weren't for the fact that it was produced with an ordinary DOS batch file. This would have been a more or less trivial task, except that DOS' ECHO command can't handle the angle brackets used in HTML, and tries to treat them as redirection characters. Putting the string to be printed in quotes solves the redirection problem, but causes the quotation marks to be printed as well, dotting redundant punctuation all over the page...

To get around this, I wrote a tiny C utility that does the job properly, and even expands environment variables. The only drawback is that you have to replace any quotation marks that you actually do want printed (around a link, for example) with backticks (`). Once again this utility is available online, as are all the programs I write for this column.

Mind your language

The upshot of all this, then, is that you can use virtually any language you like to write your program. It shouldn't take very much work at all to adapt an existing program (assuming you have the source code, of course!) to the CGI. The only limitations are that program's output must be redirectable to a file, and that it exits to DOS after completion.

This does put a bit of a crimp in QBASIC, which uses direct screen output and returns to the editor after running the program. There are ways round this, however. If you say OPEN "CONS:" FOR OUTPUT AS #1, you can just use PRINT #1 for outputting text, avoiding the direct-video text output. As for the returning-to-editor problem, you can use one of the many shareware BASIC compilers out there to compile your program as an EXE that returns straight to DOS.

For the C programmers among you, there are a number of CGI libraries out there that make CGI programming a lot nicer than the quick hack that I wrote. One such library is Eric E. Kim's cgihtml package, available from **http://www.eekim.com/software/cgihtml**. ❖

Electronics Australia is one of the longest-running technical magazines in the world. We started as *Wireless Weekly* in August 1922 and became *Radio and Hobbies in Australia* in April 1939. The title was changed to *Radio, Television and Hobbies* in February 1955 and finally, to *Electronics Australia* in April 1965. Here's some interesting items from past issues:

50 years ago

September 1948

Waveforms made to Order: A new electronic circuit for medical diagnosis and research will produce any desired waveform when its shape is cut from cardboard and placed between a cathode ray tube and a photomultiplier tube. Wave characteristics become available which are difficult or impossible by means of ordinary electronic circuits.

The device is designed to provide either single or repetitive stimuli, derived from a simple silhouette easily cut by following any desired curve drawn on cardboard. The mask so obtained is placed in contact with the screen of a CRT having a short-persistence phosphor, with the CRT trace spread vertically into a thin line by an RF oscillator. The line is caused to move from left to right by a relaxation oscillator, which sets the waveform frequency. An RCA 931-A or similar photomultiplier tube is placed about eight inches from the face of the CRT and mask. The amount of light which falls on the phototube is a function of the length of line which it sees at any instant, and this is determined by the shape of the mask. The output of the tube is approximately 10 volts with a 750V power supply and a 50kΩ load resistor.

25 years ago

September 1973

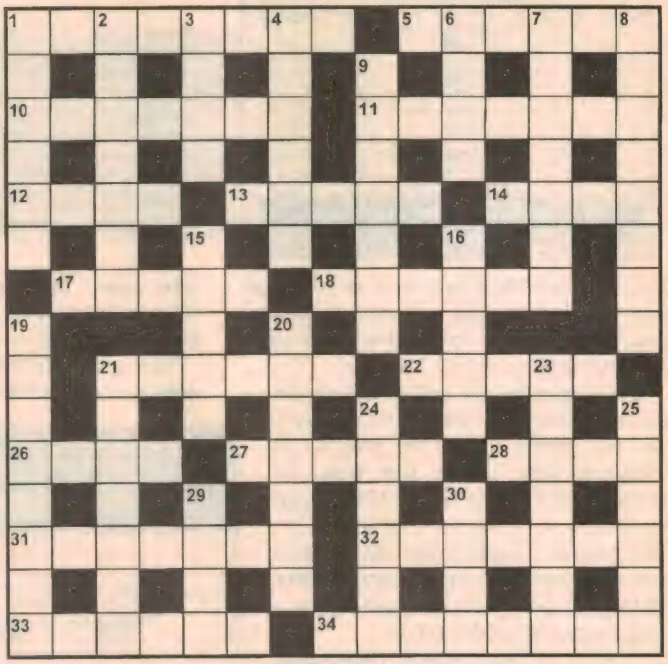
Darwin-Mount Isa Link nears Completion: Spanning 1000 miles of desert between Darwin and Mount Isa, Australia's new $10 million microwave link is nearing completion. Consisting of 43 repeater stations, some up to 250ft high, the new system will enable Darwin to dial direct to almost anywhere in Australia.

The system will have an initial capacity of 1200 channels to provide telephone, telegraph and data communications facilities for a vast area of Australia's north, and will link Darwin into the national subscriber trunk dialling network.

Low cost Computer Graphics Terminal: A high performance minicomputer based graphics terminal priced from approximately $10,000 has been announced by Digital Equipment Australia. The GT40 intelligent terminal links Digital's PDP-11/10 minicomputer to a specially designed, hard-wired display processor and a 12-inch diagonal oscilloscope. A light pen, full ASCII keyboard and character set, 31 special mathematical and scientific symbols, and an APO approved serial communications interface are standard features of the GT40.

The low-cost terminal may be used either as a stand-alone graphics system or as a remote terminal interacting with various types of host computers. ❖

Crossword



Across

1 Shape of an oscillation. (8)
5 Rapid fluctuation of a picture. (6)
10 Again inserts a cassette, cartridge etc. (7)
11 The initial phase. (7)
12 Heavy metal. (4)
13 Detect. (5)
14 Brief signalling tones. (4)
17 Winding machine. (5)
18 Elementary gas. (6)
21 Pertaining to certain iron compounds. (6)
22 Desktop hardware item. (5)
26 Built-in operating system. (4)
27 Plural of vacuum. (5)
28 Band instrument. (4)
31 Valve. (7)
32 State of non-transmission of radiated energy. (7)
33 Co-inventor of the Geiger counter. (6)
34 Inventor of the famous H4 chronometer, John ..... (1693-1776). (8)

Down

1 Periodic variation of a sound's pitch. (6)
2 Name of effect where stress changes magnetism. (7)
3 A character that signals some special condition. (4)
4 A list for duty periods. (6)
6 Radio engineers' organisation. (1,1,1,1)
7 Isotope of hydrogen. (7)
8 Store for fixed amount of digital information. (8)
9 Amplifying device. (7)
15 Written piece of music. (5)
16 Small power indicator: the .... light. (5)
19 Popular brand of diskette. (8)
20 Illegally copied for commercial use. (7)
21 View facing forepart. (7)
23 Acquires knowledge, systematically. (7)
24 Visible atmospheric phenomenon. (6)
25 Elementary particle. (6)
29 Region of a magnet. (4)
30 Organic filament. (4) ❖

August's solution:

	E	L	E	C	T	R	I	C	L	I	G	H	T	
E		O		I		A		Y		O		O		E
L	O	U	D	N	E	S	S	C	O	N	T	R	O	L
E		D		E		T		L		S		N		E
C	O	P	Y		X	E	N	O	N		S	S	S	C
T		E		Q		R		N		R				T
R	A	D	I	U	M		R	E	M	E	M	B	E	R
I		A		E		W		S		R		A		I
C	E	L	L	U	L	A	R		P	U	B	L	I	C
D				E		T		C		N		L		C
R	O	S	S		S	T	R	A	P		D	I	A	L
I		N		O		H		L		F		S		O
E	L	E	C	T	R	O	A	C	O	U	S	T	I	C
R		L		I		U		I		S		I		K
	E	L	E	C	T	R	I	C	F	E	N	C	E	

Electronics Australia's

Professional Electronics

Alcatel's manufacturing plant in Liverpool NSW sold to Bluegum Technology

Intel announces Pentium II 'Xeon' processor for servers & workstations

Texas Instruments sells its DRAM business to Micron

Designer's guide to charging Li-Ion Batteries: charger circuits and A-D's devices

Picture courtesy Apple Computer Inc., Gary Parker

Apple Computer's new US$1299 iMac computer: Is it different enough to save the company's bacon?

highlights News

Motorola to mass produce new 'biochips'

Rapid advances in medicine, health care and agriculture are expected from a joint-research project announced by Motorola, Packard Instrument Company and the US Department of Energy's Argonne National Laboratory. The project, which aims at commercializing and marketing advanced biochips and related analytical technologies, is expected to make the process of decoding genes, human or otherwise, 1000 times faster than with current technologies.

Motorola will develop manufacturing processes to mass produce the biochips, and Packard will develop and manufacture the analytical instruments to process and analyze them. Argonne's contribution, in conjunction with its Moscow research partner the Russian Academy of Science's Engelhardt Institute of Molecular Biology, is intellectual property in the form of 19 inventions related to biological microchips.

Motorola and Packard will contribute a total of US$19 million over five years to support the joint-research agreement, making it one of the largest biotechnology joint-research agreements ever signed by a US Department of Energy laboratory. Argonne's 19 inventions, which have been licensed exclusively to Motorola and Packard, are the result of more than $10 million in research support since 1994 by the US Department of Energy, the Defense Advanced Research Projects Agency, the Russian Academy of Sciences, and the Russian Human Genome Program.

Like computer chips, which perform millions of mathematical operations a second, biochips can perform thousands of biological reactions, such as decoding genes, in a few seconds.

The Argonne/Engelhardt biochips employ a novel 'micro-gel' technology in which as many as 10,000 micro-structures are mounted on a single glass surface about the size of a microscopic slide.

Each micro-gel is like a micro-test tube, in which chemical compounds can be tested against biological targets to provide answers to questions about DNA sequence, genetic variation, gene expression, protein interaction and immune response.

In addition to being faster than conventional gene sequencing methods, these biochips provide a three-dimensional platform that allows greater sensitivity and accuracy in assaying proteins, RNA and DNA.

Semiconductor distributor Fastron Technologies has moved to these impressive new premises at 25 Kingsley Close, Rowville 3178; phone (03) 9763 5155.

Compaq closing Digital assy plant in Sydney

As part of the global rationalisation following the acquisition of Digital Equipment by Compaq Computer, Digital's assembly plant in the Sydney suburb of Lane Cove is being closed. Its operations will be incorporated into Compaq's existing configuration centre in Rydalmere, the company has announced.

Compaq Australia's MD Ian Penman, who will be running the combined operation in Australia, has announced that some 300-400 jobs will be lost in Australia as part of the merger.

Voluntary recall of Tek's TDS210 & TDS220

Tektronix is voluntarily recalling its model TDS210 and TDS220 oscilloscopes after determining that certain incorrect use of the product could cause the ground connection to fail. Although there have been reports of situations in which the ground lead on the oscilloscope has opened when the products were incorrectly used, the company is not aware of any injuries to users. However, a failure of the ground connection does have the potential of exposing the user to the risk of serious personal injury or death.

If a user incorrectly connects a probe ground lead to a voltage source, or incorrectly touches the ground ring near the probe tip to a voltage source, a circuit board trace in the oscilloscope's electrical ground path may open. Once this occurs, the product may appear to function normally; however, the unit is no longer properly grounded. Subsequent use of the product could then result in a serious electrical shock to the user.

Tektronix is conducting the voluntary recall to prevent this possibility of injury to its customers and is part of the company's overall commitment to providing reliable, safe and high-quality products. This recall applies to approximately 60,000 TDS210 and TDS220 units with serial numbers below the following:

TDS210: serial numbers below B049400 or C010880

TDS220: serial numbers below B041060 or C011175.

Customers should stop using the recalled oscilloscopes immediately and contact Tektronix to receive instructions on how to return the product for modification. Customers should not assume the product is properly grounded even if it appears to be functioning properly.

Customers can receive instructions for returning the product by contacting Tektronix Australia at 1 800 023 342 ext. 193, at 800-835-9433 ext. 2400 in the US or by visiting the company's web site at **www.tek.com/measurement**.

Alcatel plant sold to Bluegum

Alcatel Australia's manufacturing plant in Liverpool, NSW has been acquired by contract manufacturer Bluegum Technology, as part of a $250 million three-year agreement between the two companies for the outsourcing of Alcatel's telephone, switches and network product manufacturing activities. The acquisition is said to position Bluegum among the top 30 private companies in Australia, and in the top 15 contract electronics manufacturers in the world.

Bluegum CEO Mr Paul Zuber said that the agreement would enable Australia to

further develop its manufacturing potential at home. "The Australian electronics hardware manufacturing market is worth A$7-8 billion, yet less than 15% is being serviced by contract manufacturers today", commented Mr Zuber.

Under the agreement, existing Alcatel operations and management will remain, providing a seamless transfer of current management and 400 employees to Bluegum on September 1. Peter Miller, manufacturing manager of the Alcatel Liverpool plant, becomes Director of Manufacturing for the new Bluegum Telecommunications.

The agreement with Alcatel is a continuation of Bluegum's expansion into the Australian electronics contract manufacturing business, which began with its purchase of IBM's Wangaratta plant in November 1997.

Iomega unveils new USB Zip drive

Iomega Corporation has announced a new, external Zip drive for use with a Universal Serial Bus (USB) interface. The company demonstrated the new drive in conjunction with Apple Computer's new iMac model in New York at the MacWorld exhibition in July. The new translucent ice-blue USB Zip drive will have the USB interface built into the drive, saving space on the desktop and eliminating the need for a larger parallel port or SCSI conversion cable. The USB Zip drive is designed to provide users of USB-equipped computers, with Mac OS 8.1 or Windows 98 operating systems, the easy connectivity of a hot 'plug and play' solution.

"IDC believes that USB will become prevalent in the market this year with an estimated 90% of desktops shipped this year with the technology", said Kevin Hause, PC analyst with International Data Corporation. "USB's market appeal is based on its plug and play functionality and ability to provide users with a single, higher bandwidth port for a range of peripherals."

USB is a low cost, high-speed peripheral expansion architecture that provides data transfer rates up to 12Mb/s. USB interfacing peripherals can be plugged and unplugged from the USB interface anytime, without requiring the user to restart their system to initiate or re-initiate use. The USB spec also supports up to 127 devices on a single computer system.

The new USB Zip drive is expected to be available late in 1998. The estimated US street price is not expected to exceed US$149. The drives will be designed to be compatible with an installed base of tens of millions of Mac and PC formatted Zip disks.

Sanyo licenses PM's HDCD technology

Sanyo Electric's MOS-LSI division, one of the world's leading suppliers of integrated circuits for consumer audio CD playback systems, has licensed Pacific Microsonics' high fidelity HDCD decoding and precision filtering technology for Sanyo's new general market audio chip.

"Sanyo is very pleased to be working with Pacific Microsonics because HDCD has become a symbol of high quality digital audio worldwide", said Toshiyuki Ozawa, Department Manager of Sanyo's System Development Division. "With Sanyo's large scale integration design skills and high volume manufacturing capability, we will be able to offer consumer electronics manufacturers a high quality HDCD chip that meets both their performance and aggressive cost requirements."

The new chip will be an enhanced version of Sanyo's current industry leading general market audio product, which integrates all major CD player circuitry on a single chip. Sanyo will add the same high fidelity HDCD decoding and HDCD filtering technology used in Pacific Microsonics' PMD-100 chip, a standard component in high end CD players around the world. Also, the D/A converters in the new chip will be upgraded from 16 to 18 bits. Target consumer product applications include high volume CD players, changers, portables, mini-component systems and automotive audio products. Sanyo expects samples to be available in the second half of 1999, and production quantities to be available soon thereafter.

In January, Motorola announced that it is adding HDCD to its 56362 DSP, and in March, Analog Devices announced it is adding HDCD to its SHARC DSP. Target consumer product applications for these chips include A/V receivers and DVD players.

Developed by Pacific Microsonics in Berkeley, California, HDCD (High Definition Compatible Digital) is a patented process for delivering on Compact Disc the full richness and detail of the original microphone feed. HDCD encoded CDs sound better because they are encoded with 20 bits of real musical information as compared to 16 bits for conventional CDs.

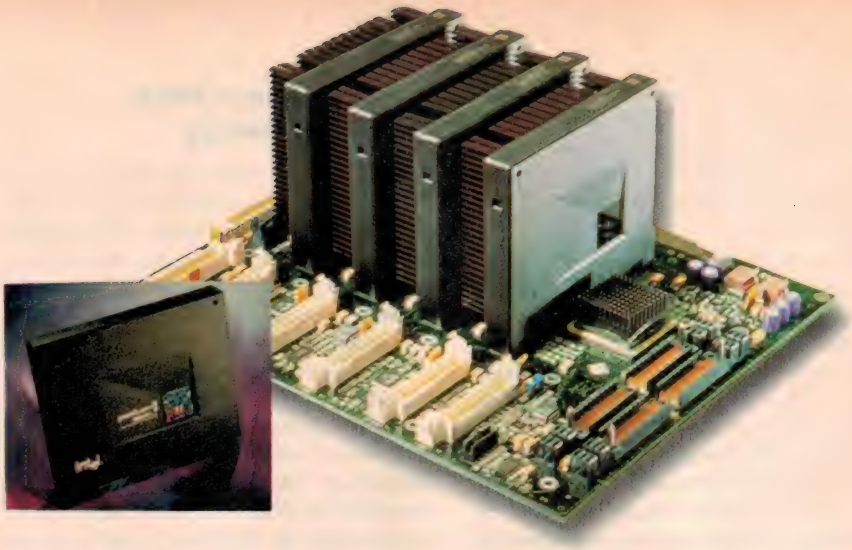
Scientists and support people working in Antarctica can now use cellular phones to call anywhere in the world, thanks to a new cell site installed last May by Lucent Technologies engineers. The site is satellite-linked to Rivadavia in Argentina. (Business Wire)

HDCD provides more dynamic range, a focused 3-D sound stage and extremely natural musical timbre. HDCD recordings offer improved sound quality on any CD player, and when played on HDCD equipped players, they are claimed to provide the ultimate in sonic fidelity.

Pacific Microsonics says that over 50 million HDCD CDs have been shipped to date and over 100 HDCD equipped CD player products are now available.

Philips shipping CleverCast DVB cards

Philips Digital Video Systems Company, a leader in the field of digital data broadcasting, has begun mass production of the CleverCast PC-DVB Receiver card. Volume shipments



were to begin in the second quarter of 1998.

Poised to gain a competitive advantage by being the first to announce volume shipments, Philips is prepared for the high market demand of PC-DVB Receivers. The Philips CleverCast PC solution is claimed to be compatible with every IP based application. Applications such as Precept Software's IP/TV, StarBurst, Microsoft NetShow, Philips Broadcast FTP and services from DataCast and The Fantastic Corporation are said to run seamlessly on the platform, with CleverCast PC's adherence to both broadcasting standards (DVB SI-Dat) and Internet/PC standards (TCP-IP, Microsoft Windows 95/NT).

To date, Philips has successfully supplied complete end-to-end solutions, from uplink equipment to PC-DVB Digital Receivers and DVB compliant Data Broadcasting Systems — to such prestigious international broadcasters as Deutsche Telekom (Germany), Teracom (Sweden), Telenor (Norway), RAI (Italy) and Digital Express (USA).

The CleverCast PC Data Broadcasting System allows for the reception of digital multimedia data (audio, video and data) which is broadcast at high speeds through digital satellite transmission systems to personal computers. This application makes it possible to transmit data in a digital form to a single user (unicast), a group of users (multicast), or to all users with access to the service (broadcast). The platform can be used for new services such as Broadcast File Transfer and High Speed Internet.

High-speed data broadcasting to the PC, currently available at a rate of 16Mb/s, will be available at an increased rate of 45Mb/s before the end of 1998. Since the data, usually in a compressed form, need only be transmitted to the satellite network once, this data 'push' method saves bandwidth and reduces transmission costs drastically.

Intel introduces Pentium II Xeon

Intel Corporation has introduced a new family of processors designed to meet the demanding requirements of mid-range and higher servers and workstations. The new Pentium II 'Xeon' processors feature technical innovations specifically designed for workstations and servers which run demanding business applications such as Internet services, corporate data warehousing, digital content creation, electronic and mechanical design automation.

The Pentium II Xeon processor delivers industry leading performance from its larger and faster Level 2 (L2) caches, multiprocessing capabilities and a 100MHz system bus. Systems based on the Pentium II Xeon can be configured to scale up to four or eight processors and beyond. The combination of the pure performance of the Pentium II Xeon processor and this scalability are claimed to bring exceptional levels of price performance to the server and workstation market segments.

Intel claims Pentium II Xeon processor-based servers deliver the industry's best four-processor TPC-C result to date, with a rate of 18,127.40 tpmC running on Compaq's ProLiant 7000 6/400 with Microsoft Windows NT4.0 and SQL Server 7.0. (The benchmark measures the rate of common database transactions in an online transaction processing environment such as a customer service call centre).

Key features of the Pentium II Xeon processor include a 0.25 micron P6 microarchitecture core featuring Dynamic Execution, operating at 400MHz; 512KB and 1MB L2 cache options; Intel's Dual Independent Bus featuring a 400MHz L2 cache bus, operating at the same speed as the processor core, a 100MHz transactional System Bus and 100MHz SDRAM and EDO memory support, allowing faster communication between the processor and other parts of the computer system; support for greater than 4GB of memory for servers using Intel's Extended Server Memory Architecture; and addressable memory support up to 64GB.

DKD accredits Fluke calibrators

Fluke Corporation claims it has become the first US electronics manufacturer to receive accreditation for both its standards laboratory and calibrator production facilities by Germany's Deutscher Kalibrierdienst (DKD), the laboratory accreditation body of the German national standards organization. The accreditation allows Fluke to provide globally recognized, legally traceable test data for most Fluke calibrators, eliminating the time and expense to re-calibrate instruments shipped to users outside the United States.

According to Fluke standards laboratory manager, Ray Kletke, this accreditation is something of a landmark. "This is the first time anyone in the US has worked with a member of the European co-operation for Accreditation (EA). It involved a lot of collaboration between Fluke and the national standards organizations

IN BRIEF

- The postal address for computer-aided design tools specialist ***Protel International*** has changed; it's now PO Box 427, Frenchs Forest 1640.
- Frequency control product supplier ***Hy-Q International (Australia)*** has changed its email address, which is now **sales@hy-q.com.au**.
- Software and computer peripherals distributor ***Dataflow Computer Services*** has appointed former Philips Australia Chairman and CEO Justus Veeneklaas to its board of directors.
- Technical training specialist ***TTC Australia*** has introduced technology training courses which can be supplied as either cost effective computer-based packages or professionally run courses. Courses available during September 1998 include 2M Transmission Fundamentals, Frame Relay Technology & Implementation, ATM Technology & Implementation, ISDN Fundamentals & Implementation, and An Introduction to LANs and Internetworking. For more information contact TTC on (03) 9563 4800 or (02) 9926 1447.
- ***SMT China '98***, the 2nd China International Surface Mount Technology Exhibition, will be held September 22-25 at the INTEX International Exhibition Centre in Shanghai. For more information contact organisers Messe & Kongress GmbH in Stuttgart, Germany; fax (+49 711) 66197-79. ❖

of the US and Germany."

The Fluke production facility is accredited as an extension of the corporate standards laboratory, so each final test system on the production line falls under the lab's responsibility. Each system is highly automated, eliminating most manual intervention in the final test stages. Finally, all stations are monitored continuously as part of a statistical process control loop.

AMD to deliver chip for HomePNA

AMD, a founding member of the Home Phoneline Networking Alliance (HomePNA), has announced that it will deliver single chip, low-cost silicon implementations based on the Alliance's initial 1Mb/s specification for telephone wire networking. Production samples will be available for integration onto motherboards, circuit boards, network interface cards and other consumer electronics devices during the Q4 of 1988.

The HomePNA is a consortium of the leading computing and communications companies, working together to ensure the adoption of a single, unified phone line networking standard. The HomePNA has adopted a robust technology based on existing Ethernet standards to support the use of telephone wiring to network computers, peripherals and digital devices throughout the home.

"AMD is committed to helping the HomePNA drive industry standards for phone line networks capable of meeting the growing requirement within the home for easily deployed networking capabilities," said Tom Eby, Group VP of AMD's Communications Group.

Founding members of the HomePNA include 3Com, AMD, AT&T Wireless, Compaq, Epigram, Hewlett-Packard, IBM, Intel, Lucent, Rockwell and Tut Systems. Further HomePNA information is available on the World Wide Web at **www.homepna.org**.

P&G transducers help launch Ariane 5

Four different types of linear displacement transducers (LVDTs) made by control technology specialists Penny & Giles have been used in the European space program. The

LVDTs were used on the solid boosters, the first stage Vulcain engine and the second stage Aestus engine of the Ariane 5 launch vehicle.

LVDTs are installed on the direct drive valves and servo actuators used for both the thrust vector control of the solid boosters and the Vulcain engine of the first stage; and the Aestus engine of the second stage. The LVDTs for the solid boosters and Vulcain engine were supplied to SABCA (Societe Anonyme Belge de Constructions Aeronautiques) of Belgium, who were involved in the design and manufacture of direct drive valves and servo actuators for the project.

Penny & Giles were introduced to SABCA by their Belgian distributor EIG Benelux, and were selected to supply LVDTs for the Ariane 5 servo actuators following an engineering development programme to produce qualified product to SABCA's specifications. The company received its first order for the project in 1989 and their LVDTs made it into space with the successful launch of mission 502 from Kourou, French Guyana on 30th October 1997.

A third Ariane 5 launch is scheduled for Summer 1998 and commercial launches are expected to begin in the second half of 1998.

More information is available on Penny & Giles products from distributor Control Devices, on (02) 9356 1943.

Growth expected in flat panels

Although the North American market for portable computers is the world's largest, most displays are incorporated into computers overseas, mainly Taiwan. The fastest and most profitable growth is expected to be in applications other than portable computers. Major manufacturers are now targeting emerging markets such as flat panel display (FPD) monitors and non-portable TVs.

According to strategic research conducted by Frost & Sullivan (**www.frost.com**) and presented in the report *North American Commercial and Consumer Electronics Flat Panel Display Markets*, the total market is expected to reach almost US$9.5 billion in 2004. As prices become viable, the FPD monitor market and non-portable FPD TV market are expected to grow the fastest.

The improvement of established technologies and the development of new ones are major drivers in the FPD market. New technologies including plasma, field emission displays (FED) and digital micromirror devices (DMD), as well as improvements in liquid crystal displays, are expected to create new markets and challenge existing technologies.

"The major concern for market participants is achieving low price through cost effective manufacturing", says Frost & Sullivan Analyst Jouni Forsman. Currently, FPD prices are too high to allow for the maximum attainable market penetration. ❖

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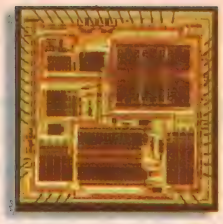
Solid State Update

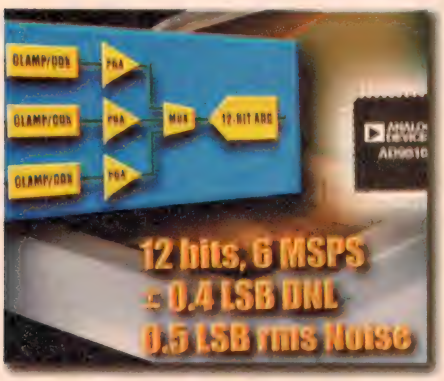


Keeping you informed on the latest developments in semiconductor technology

Analog CCD and CIS signal processor

Analog Devices has released the AD9816, a 12-bit, 6MS/s Analog-Front-End (AFE) that integrates an analog to digital converter (ADC) with the analog circuitry needed for three-channel (RGB) image conditioning and sampling. The AD9816 can be programmed through a serial interface, and also includes an input pin for offset adjustment that will give users greater flexibility to use any type of CIS sensor currently on the market.

The AD9816 will perform all the signal processing necessary for applications such as mid- to high-end desktop scanners, digital still cameras, medical X-rays, security cameras and any instrumentation applications that 'read' images from CCD and CIS sensors.



The signal chain of the AD9816 consists of an input clamp, correlated double sampler (CDS), offset adjust DAC, programmable-gain amplifier and a 12-bit CMOS ADC core. It has been designed to run at 6MS/s with good linearity and noise performance and to guarantee no missing codes at maximum conditions — while running at 6MHz in three-channel CDS mode.

The AD9816 has a DNL of +/-0.33LSB. At gain = 1x noise is only 0.5 LSB RMS. In fact, even at gain = 6x the noise is only 0.8, which is far superior to the AD9816's closest competitor. Crosstalk on the AD9816 is less than 1 LSB.

The AD9816 operates from a 5V supply and typically consumes just 500 mW of power. For more information circle **271** on the reader service card or contact Analog Devices, PO Box 2098, Rosebud Plaza 3939.

Multimode Ultra2 SCSI terminator

A new multimode SCSI terminator that holds termination resistance more closely to the 110-ohm spec than comparable devices is available from Dallas Semiconductor. Fully compliant with emerging Ultra2 SCSI specifications, the DS2118M is a multimode, low-voltage differential/single-ended (LVD/SE) Ultra2 SCSI terminator that provides active termination for nine signal line pairs.

Because Dallas laser-trims resistor ladder structures within each device, the DS2118M can hold the SCSI-specified 110-ohm termination resistance to +/-5%. Comparable devices show a tolerance of +/-8%.

"As a multimode SCSI terminator, the DS2118M contains circuitry that determines if a bus requires SE or LVD termination," said Charles Tashbook, product manager. "The chip automatically selects the proper mode."

The DS2118M has a low power-down capacitance of 3pF and on-chip thermal shutdown circuitry.

For more information contact Dallas Semiconductor, 4401 S. Beltwood Parkway, Dallas Texas 75244-3292 USA.

'Smallest 500mA LDO regulators

Micrel Semiconductor has announced its new 500mA range of low power, low dropout (LDO) regulators, the M1C5219 and M1C5216. Both devices are available in power MSOP-8 and Micrel's 'IttyBitty' SOT23-5 packaging, claimed to make them the industry's smallest 500mA regulators.

Micrel's power MSOP-8 package has a fused leadframe to improve thermal resistance, providing it with the power handling capabilities similar to a much larger SO-8 package. Power dissipation constraints typically limit output current in SOT23-5 devices to less than 150mA. The M1C5219 and MIC5216 provide 500mA capability for applications with occasional or periodic demand for high current; these applications have previously required much larger products in SO-8 packaging.

The M1C5216 and M1C5219 are suited for mobile applications where small size and high efficiency are critical. Low dropout voltage of 300mV at 500mA, low quiescent current of 80uA and a shutdown pin extend battery life, while in shutdown, the devices have a near-zero supply current. Tight initial accuracy of 1% and excellent line and load regulation ensure a precise output voltage.

Both the MIC5219BM5 and MIC5216BM5 are available with adjustable or fixed output voltages of 3.0V, 3.3V, 3.6V or 5.0V.

For more information circle **272** on the reader service card or contact GEC Electronics Division, Unit 1, 38 South Street, Rydalmere NSW 2116.

16-bit DAC with serial micro interface

Burr-Brown's new DAC716 is a high resolution, monolithic 16-bit digital-to-analog converter (DAC) with serial microprocessor interface, specified for industrial process and control applications such as robotics, motor speed control, and equipment motion controllers.

The DAC716 is complete with an internal +10V temperature compensated voltage reference, current-to-voltage amplifier, a high-speed synchronous serial interface, a serial output which allows cascading multiple converters, and an asynchronous-clear function which immediately sets the output voltage to zero.

The output voltage range is 0 to +10V while operating from +/-12V to +/-15V supplies, and the gain and bipolar offset adjustments are designed so that they can be set via external potentiometers or external DACs. The output amplifier is protected against

short-circuiting to ground.

Other features include 600mW power dissipation, fast settling time (10us to 0.5LSB), and 15-bit monotonic performance over temperature.

For more information circle **273** on the reader service card or contact Kenelec, 2 Apollo Court, Blackburn 3130.

Triple 140MS/s ADC for SXGA LCD monitors

Analog Devices has introduced the AD9483, a triple 8-bit analog-to-digital converter (ADC) that has been optimized for digitizing RGB graphics signals from personal computers and workstations, as needed to drive LCD monitors.

With a 140MS/s encode rate and full-power analog bandwidth of 300MHz, the AD9483 can support display resolutions up to 1280 x 1024 at 75Hz, with sufficient input bandwidth to accurately acquire and digitize each pixel. These features, along with a 1V peak-to-peak analog input range and low power dissipation (less than 1.5W at +5.0V) makes the AD9483 very suitable for RGB graphics processing for LCD monitors, graphics projectors, and plasma display panels.

To minimize the user's system cost and power dissipation, the AD9483 includes an internal +2.5V reference and track-and-hold circuit. All the user has to do is provide +5V and an encode clock — which means that no external reference or additional drive circuitry will be needed for many applications.

The encode input of the AD9483 interfaces directly to TTL, CMOS, or positive-ECL logic, and will operate with single-ended or differential inputs. The digital outputs are three-state CMOS and may be powered from either a +3.3V or +5V supply.

For more information circle **274** on the reader service card or contact Analog Devices, PO Box 2098, Rosebud Plaza 3939.

Dual channel 20-bit delta-sigma ADC

Burr-Brown's new DDC 112 is a dual input, wide dynamic range, charge digitizing analog-to-digital converter (ADC) with 20-bit resolution. It is designed to accept low-level input currents from direct photosensor digitizer applications such as CT (computed tomography) scanners, infrared heat detectors, liquid or gas chromatography, and blood analysis.

The DDC 112 combines the functions of current-to-voltage conversion, integration, input programmable full scale gain amplification, A/D conversion, and digital filtering to produce precision, wide dynamic range digital results. Charge integration is continuous as each channel contains two integrators — while one is being digitized, the other is integrating.

The device offers the ability to use external integrating capacitors, thus allowing a user-programmable full-scale range up to 1000pC. In addition, the serial I/O register can be configured to allow multiple DDC112 units to be cascaded, minimizing interconnections. Other features include single supply operation, integral linearity (+/-0.005% reading +/-0.5ppm FSR), and digital filter noise reduction (3.2ppm RMS).

For more information circle **275** on the reader service card or contact Kenelec, 2 Apollo Court, Blackburn 3130.

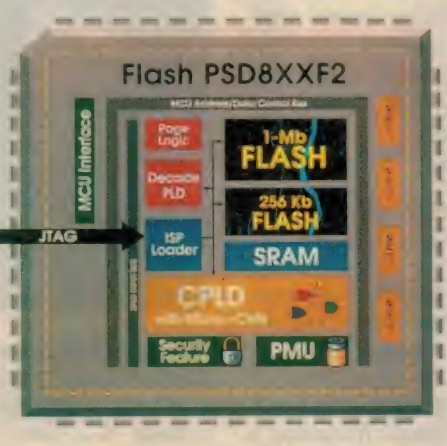
MCU support IC has 3000 gate CPLD

WSI's latest addition to its family of flash MCU support ICs, the PSD8XXF2 integrates high-density (serial or parallel programmable) concurrent flash memory with complex programmable logic, SRAM, extra I/O and a programmable microcontroller interface.

The PSD8XXF2 allows flash memory erase/write operations to be performed during program execution by providing two flash memory arrays of 128K and 32K bytes. The 128KB flash array is used for system program store and the 32KB (four 8KB sectors) array is used to store boot algorithms, programming algorithms and NVM data. Since the system can execute code from either flash array, each can be programmed concurrently with system operation.

In addition to the two ISP flash arrays, the PSD8XXF2 has a 2KB scratchpad SRAM, a 3000 gate Micro-Cell CPLD, a special ISP decoding PLD, extra I/O and a programmable interface to most microcontrollers from Philips, Intel, Motorola, Siemens and others. A JTAG interface is provided for first-time and subsequent serial ISP that is six times faster than parallel programming.

For more information contact WSI, 47280 Kato Road, Fremont 94538 California, USA. ❖



New Products

'Smallest 20W switcher'

Claimed to be the smallest yet, the recently introduced GSC20 compact 20W switching power supply from Powerbox is very suitable for overhead projectors, data communications devices and any application needing a compact, portable and reliable power source. It has a footprint no bigger than a business card, measuring 87.5 x 50 x 17.2mm, but delivers an output of 4W/in³.

With an input voltage range of 90 - 264V AC, the GSC20 has fixed frequency operation and standard overvoltage protection, and complies with EMI FCC Class B, CISPR22B. It is approved to UL1950, IEC950, CSA 22.2 No.234 Level 3 and EN60950.

The GSC20 is available in five versions, with power levels from 5 to 28 volts and carries a two-year warranty. Medical configurations are available on request.

For more information circle **241** on the reader service card or contact Powerbox Australia, 4 Beaumont Road, Mt Kuring-gai 2080.

Handheld tester finds comms cable faults

The new Tektronix TV90 CableScout time domain reflectometer (TDR) is a low-cost, high performance handheld instrument for maintaining and installing communications cabling systems. Outside plant technicians and installers in the cable television (CATV) industry can use the instrument to locate and troubleshoot cable faults in new or existing coaxial drop cable.

The TV90 CableScout's easy-to-use one-step setup and two-step test ensures quick results, reducing repair time. Technician training time is also decreased with the help of a simple user interface.

The instrument can test cable distances greater than 4000 feet and provides distance accuracy to +/-2 feet. It is weather-proofed for operating temperatures of 0 to +45°C with 95% humidity. It is also easily portable, weighing only 1kg and measuring just 211 x 141 x 43mm.

For more information circle **242** on the reader service card or contact Tektronix Australia, 80 Waterloo Road, North Ryde 2113.

PC-based power analyser

The EasyPower Measure is a first-of-its-kind, PC based power measurement instrument that can be used as a user-interactive three-phase power analyser or a stand-alone power-quality monitor. At a fraction of the price of other full featured analysers, the portable system provides real-time waveform display and data management using the familiar graphical user interface and intelligence of a notebook PC, which eliminate the blind collection and disorganised information storage associated with typical power analysers.

With the EasyPower Measure system, the PC is the instrument. The measurement front-end supplies the voltage and current data directly to a notebook PC in real time via four voltage inputs (1250V peak differential via sheathed banana safety connectors) and four current clamp inputs. As data is collected, the PC performs all of the power calculations, provides graphics and numeric tables, and stores the data to its hard drive in real time. Data collection accuracy is +/-0.03% for both current and voltage and measurement resolution is 12 bits. Sample frequency is 128 samples per cycle nominal and 256 points per cycle maximum, while the maximum single-channel sample rate is 500kHz.

The EasyPower Measurement platform offers five power measurement modes. The Phasor Diagram mode comes standard with the EasyPower Measure; Detailed Harmonics, Spectrum Analyser, Cycle-by-Cycle and Event/Demand Capture measurement modes are available options. With all of these modes, wave shapes, calculated waveforms and numeric tables can be easily viewed on the PC's monitor in real time.

For more information circle **246** on the reader service card or contact Scientific Devices Australia, 118 Atkinson Street, Oakleigh 3166.

RF chokes for PCB mounting

The new Schaffner RN-series chokes are designed to provide high attenuation of common mode interference in the range of 100kHz to 3MHz, while differential mode signals in the operating range of the chokes (DC - 1kHz) encounter zero inductance. Typical applications include uninterruptible and switch-mode power supplies, DC-DC converters, etc.

The RN series employ toroidal ferrite cores, offering a very high inductance to volume ratio. Dual current-compensated windings prevent core saturation when handling large peak currents.

The chokes are available for load current ratings from 0.3A to 10A with a voltage rating of 250V, and with path inductances ranging from 0.7mH to 100mH. They are well suited to PCB mounting, being available in low-profile or small footprint housings. The RN chokes are manufactured to rigorous quality control standards, and withstand winding-to-winding and winding-to-housing voltages of 1500V and 4000V AC respectively, for one minute.

For more information circle **243** on the reader service card or contact Westek Industrial Products, Unit 2, 6-10 Maria Street, Laverton North 3026.

Hall effect AC/DC high current sensors

The L series range of Hall effect current sensors from Practical Control Solutions are suitable for measuring currents from 500 - 2000 amps at frequencies from DC to 10kHz. The bipolar output is +/-4V DC full scale, with a positive voltage for positive current flow. A +/-15V 30mA DC power supply is required, which is also available from PCS.

Unlike shunts the Hall effect sensors are fully isolated from the DC bus, allowing the use of grounded control equipment. Also no heat is dissipated across the Hall effect sensor, making the cooling measures required for high current shunts unnecessary.

For more information circle **244** on the reader service card or contact Practical Control Solutions, PO Box 1052, Mount Waverley Delivery Centre, Mount Waverley 3149.

Handheld E1 tester

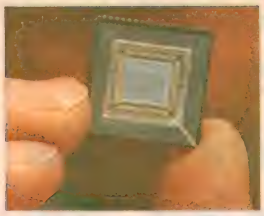
TTC Inc's TTC 132B Communications Analyser is designed to help field installation and maintenance by combining E1 (2Mb/s) analysis features into a compact and rugged instrument. The instrument's Auto Configuration feature provides quicker and easier instrument setup by determining and synchronising to the framing format and pattern, thus automatically configuring to the signal under test.

Easy to read Results Summary indicators provide instant information to the user about circuit status. With this information available at the user fingertips, circuit problems are efficiently identified and sectionalised. For long term unattended testing in the field, the TTC132B offers event-print and timed-print outputs.

Additional highlights of the instrument include an active timeslot display for simple identification of channel activity, as well as results summary and front panel LED's that offer immediate indication of critical circuit parameters such as error events, alarm conditions, and configuration status.

The TTC132B is available immediately and will sell in Australia and New Zealand for under A$7000.

For more information circle **245** on the reader service card or contact TTC Australia, 41 Stamford Road, Oakleigh 3166. ❖



Silicon Valley Newsletter

TI sells its DRAM business

COMPLETING A YEAR-LONG move out of the volatile memory chip market, Texas Instruments has sold its memory chip business unit to the only other American DRAM producer, Micron Technology for US$800 million. TI also said it will lay off 3500 workers due to continued weakness in the overall semiconductor market. The lay-off, about 8% of the company's global workforce, will save the company US$270 million in annual operating expenses.

TI officials said the company is ridding itself of the memory operations at a considerable loss. But prospects for a return to profitability appear so dim right now, TI believes it stands to lose far more if it has to continue making heavy R&D and capital investment commitments to the memory field.

As part of the transaction, Micron will get a number of state-of-the-art chip production facilities in Italy, Singapore and Richardson, Texas. TI will also close a second Richardson operation with Micron getting the building.

The sale to Micron does not come unexpected. For much of the past year, TI has been reducing its committment to the memory business, including selling or abandoning memory business interests in joint ventures with Taiwan's Acer and Japan's Hitachi. Instead TI is focusing its semiconductor business on digital signal processors and other high-end circuits where there is considerably less competition or pressure on prices.

Is DVIX dead?

DVIX, A CONSUMER technology that competes with standard DVD video, appears on its last legs as sales of DVIX players and disks have been lacklustre. Several major US distribution retail chains are said to be close to pulling out of the DVIX business and focus on DVD instead.

DVIX allows consumers to purchase a digital video disk for around US$5, compared to US$20 for regular DVD titles. But users have to pay about US$3 for each viewing. Consumers in the US have so far shown a much stronger preference towards owning DVD movies outright, or paying about $3 to rent them from a local video and DVD rental store.

Meanwhile, 20th Century Fox Studios announced it is going to market DVD movies, after holding out on the DVD business until now. The home video units of Walt Disney and Time Warner have also announced that they are banding together in an international DVD distribution pact. Under the deal, Warner Home Video will distribute DVD movies from Buena Vista Home Video, the Disney unit, in 30 territories spread across Europe, the Middle East, Africa and in former Soviet Union countries. The agreement covers over 100 titles and runs through the year 2000. Each of the movies will be released simultaneously in DVD and on videotape in the VHS format.

AT&T buys TCI for US$48 billion

IN YET ANOTHER mega merger in the telecommunications industry, AT&T announced it has agreed to pay a whopping US$48 billion for America's largest cable TV operator, Tele-Communications Inc (TCI). The deal opens the way for AT&T to offer 33 million consumers and businesses a one-stop shopping option for a broad range of services, from cable TV to home shopping to high-speed Internet access and local and long distance telephone calls.

AT&T said it will set up a new company, to be known as AT&T Consumer Services, which will offer one-stop shopping for long-distance and cellular phone calls, cable television and high-speed Internet access. "We are merging with TCI not just for what it is, but for what we can become together", said AT&T chairman Michael Armstrong. John Malone, chairman of TCI, has agreed to become a member of the AT&T board.

Armstrong joined AT&T only last year. The TCI deal is the biggest in a series of aggressive moves he has made in his short tenure. In late 1997, he bought Teleport Communications Group for US$11.3 billion and recently AT&T said it would lay off 18,000 people. He has also forged marketing alliances with several Internet search companies.

TCI will now allow AT&T to provide local telephone service using TCI's cable TV network instead of using traditional phone lines. That gives AT&T a crucial, direct link to consumer's homes bypassing the Baby Bells' infrastructure altogether. "Today we're beginning to answer a big part of the question about how we will provide local service to US consumers", Armstrong said.

Rockwell quits the chip business

ROCKWELL INTERNATIONAL, a leading US producer of communications and other ICs, said it is spinning off the chip business into a separate company and laying off some 3800 workers in the process. The move is expected to cost Rockwell US$625 million in write-offs.

"The dynamics of semiconductor systems are very different from Rockwell's other businesses, including its markets, products, and investment requirements", said Rockwell chairman Don Davis in explaining the decision. "Splitting the companies will help Rockwell enhance their ability to achieve their full potential", he added.

The elimination of the IC operations follows a 1996 decision to sell the firm's defense and aerospace operations. And a year ago, Rockwell also spun off its automotive parts operations.

The IC spinoff is expected to be completed by the end of the year. The company's full restructuring program will be completed by the end of 1999.

LSI buys Symbios as Adaptec bows out

SYMBIOS HAS YET another parent company, as LSI Logic announced plans to pay US$769 million to Hyundai Electronics. Earlier this year Adaptec, located just one block down the street from LSI Logic in Milpitas, had agreed to pay US$775 million agreement for Symbios. Adaptec said it didn't expect the US Federal Trade Commission to approve the merger and was ending the merger process.

LSI officials said their company had been one of several companies that bid on Symbios. Hyundai initially chose Adaptec. The FTC, however, objected, stating the Adaptec/Symbios merger would concentrate too much of the data communications interface market with one vendor.

The Symbios acquisition means LSI will be able to offer its customers SCSI technolo-

gy. "This major acquisition reflects our strategy of further penetrating the high-end computing and storage markets", said Wilf Corrigan, LSI Logic chairman and chief executive. "This is the largest acquisition in the history of LSI Logic. LSI goes from being a US$1.3 billion company to being a $2 billion company."

Symbios is based in Fort Collins, Colorado. The company makes client/server ICs, host adapter boards and similar components. The company had 1997 revenues of US$620 million and operating income of $70 million before non-recurring charges.

AT&T, which acquired Symbios in the NCR merger, sold Symbios to Hyundai in 1995. At that time, Adaptec was among the bidders for the unit.

Motorola loses $1.3Bn

MOTOROLA'S TINY US$6 million operating profit was overshadowed by $1.9 billion in corporate restructuring charges that caused the firm to report a net loss of US$1.3 billion. A year ago, it earned $392 million.

The impact of the Asian crisis, which is to blame for most of Motorola's woes is likely to continue for at least another year, said CEO Christopher Galvin.

Compaq begins its restructuring

MAJOR LAY-OFF announcements are starting to come out of Compaq on a weekly basis, in the wake of the Digital Equipment merger and increasing softness in the personal computer market. Compaq said it is firing 5000 additional workers and closing eight facilities around the world as part of the assimilation of Digital. The 5000 are part of the total of 17,000 jobs, which are expected to be lost as a result of the merger, a combined workforce reduction of 20%. The combined company will have about 67,000 workers when the consolidations are completed, a process that will cost Compaq some US$5.4 billion in charges against its earnings.

The company is expected to save several billion dollars year in operating expenses as a result of the restructuring. "Integrating all Compaq manufacturing operations into a single, cohesive organization is essential as we build the future Compaq", said Compaq CEO Eckhardt Pfeiffer. "It is important to say that the loss we expect is different than the operational result. This charge is positioning the company for the future."

Pfeiffer insisted that customers will benefit from the streamlining, which is aimed at allowing Compaq to deliver 95% of its products anywhere in the world in less than five days. Currently it can take weeks, because the company ships through distributors and others who add to the time it takes to get the product to the end user.

Gates alone at the top with US$51B

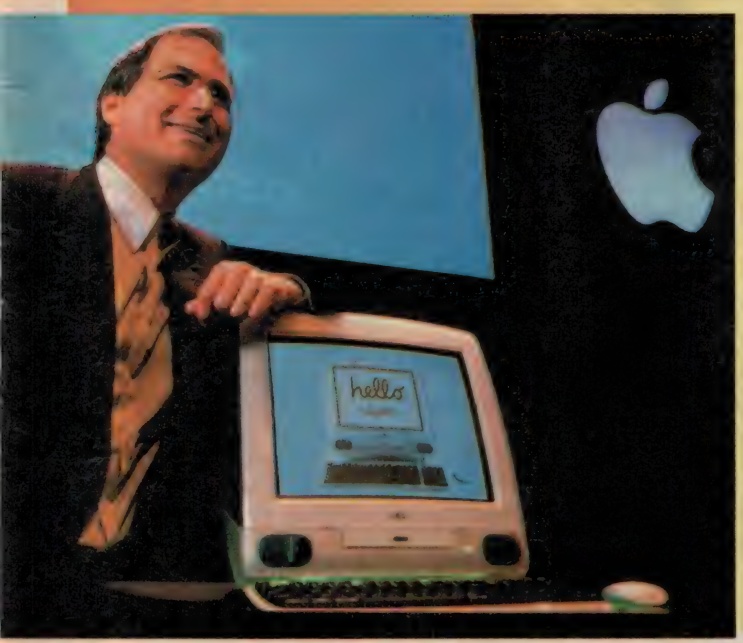
Not surprisingly, Bill Gates once again topped *Forbes Magazine*'s list of the world's richest and actively working individuals. The magazine put Gates' net worth at US$51 billion, up 40% from a year ago.

Gates came within one bad day on Wall Street of losing the title he has held for four years, to the heirs of the late Sam Walton, founder of the Wal-Mart chain of discount superstores. They're worth US$48 billion. ❖

Will Apple bounce back with the iMac?

APPLE'S NEW IMAC computer took centre stage at the recent MacWorld Expo in New York, and is expected to help Apple report high sales and earnings in the next quarter. Analysts expected Apple to ship as many as 400,000 iMacs in the quarter ending in September.

A reviving Apple is also expected to report its third consecutive quarterly profit for the period that ended June 30, driven by strong demand for G3 systems, said CEO Steve Jobs during an unscheduled keynote address at the MacWorld show. "I am very pleased to tell you that it will be our third consecutive profitable quarter", said Jobs, who was greeted with a thunderous standing ovation. Jobs said Apple is putting new efforts behind supporting its customer base in traditional Macintosh strongholds, such as desktop publishing, education and design.



A year ago Jobs and Microsoft chief Bill Gates were booed at the then Boston-based MacWorld, when the two announced Microsoft's US$150 million investment in Apple in return for stock and Internet Explorer becoming the default browser on the Mac platform. Jobs said the program has done wonders for Apple and the firm is working hard to further strengthen its ties with Microsoft. "Despite the booes of a year ago, this partnership has blossomed", Jobs said.

"With this product we expect to see some additional growth within the next six months at Apple", Jobs said, noting that the iMac was Apple's first product in several years designed to appeal to both the educational and consumer markets. The iMac, priced at US$1299 and loaded with dozens of nicely designed features, is expected to revive the magic of the early Macintosh line among consumers. The iMac relies on a Motorola PowerPC processing chip that can handle many computer tasks at far faster speeds than the most powerful Wintel-based PCs.

"The iMac will deliver the best and easiest-to-use Internet experience, tons of great consumer software, a variety of great add-on peripherals, and yes, a high-speed 56K modem. We will have lots of iMacs on dealer shelves for the US launch on August 15, right on schedule," Jobs said.

Designer's Guide
to Charging Li-Ion Batteries - 2

In the first of these articles we looked at the construction and operation of modern lithium-ion cells and batteries, and their basic charging requirements. Now we can look at the different kinds of charger circuit that can be used, and the devices available to implement them.

by Joe Buxton Battery Chargers Design Engineer, Analog Devices Inc.

Once the battery type has been chosen, the next major question is which charger topology to use. This question needs to be answered regardless of the battery chosen, but the following discussion concentrates on Li-Ion.

The topology choice depends upon the application and various system considerations. For example, an in-phone charger (placed inside a cellular phone) would probably need to be a switching regulator buck topology, for the efficiency. A linear charger in the same application would dissipate too much power and generate too much heat. Thus, the efficiency of the charger may be more important because of the heat generated rather than the power lost.

In all chargers, there must be a power source. Typically it is an AC/DC adapter, often called a 'wall adapter', 'plug pack' or 'brick'. An exception to this is a charger for use in a car. This charger uses the car's 12V DC.

For portable computers, the most common approach is having an external brick that provides a DC input to the computer and an internal charger circuit. However the brick can be moved inside the computer and combined with the charger. There are advantages to each approach.

The external brick is typically an off-the-shelf item that does not require a separate design. The internal brick saves the consumer from having to carry additional cords and the brick itself. Furthermore, combining the brick with the charger can save system cost. Essentially, the combination becomes an AC/DC supply with 51% output voltage regulation and programmable output current. In the case of the external brick with an internal charger, the ADP3801/02 buck topology is ideal. On the other hand, the ADP3810 charger was designed primarily for AC/DC charger applications.

Another application is a cellular phone charger. Again, there are several different topologies: an in-phone charger, a desktop charger and a car adapter charger. In the case of the desktop charger, again the application can be divided into an external brick (wall adapter) or an internal brick/charger combination. Also, since the charger sits on a desktop, a linear charger such as the ADP3820 may be the best solution. However, an in-phone charger would probably require the efficiency of a buck solution such as the ADP3801/02.

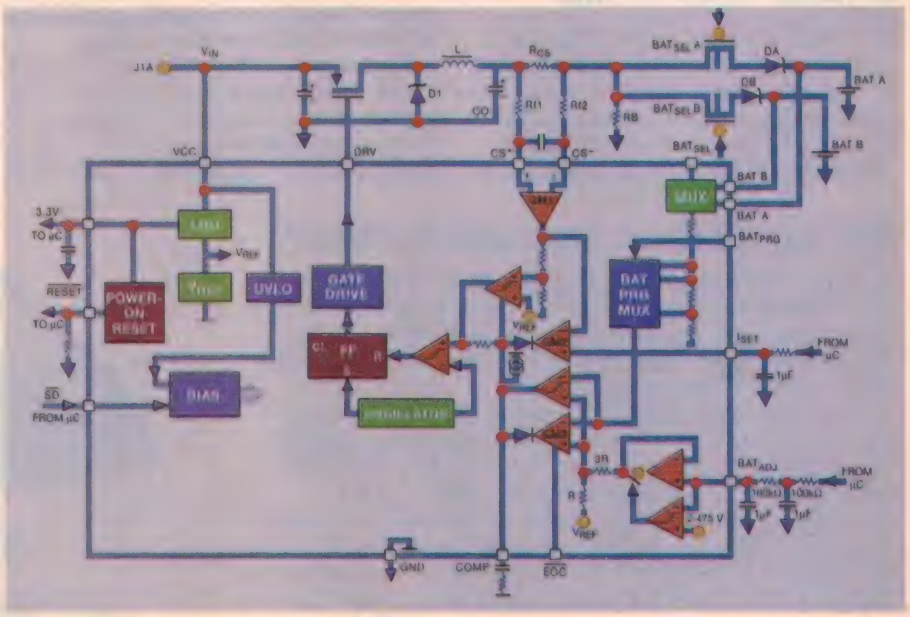


Fig.6: A 'buck regulator' type of dual Li-Ion battery charger, pairing the ADP3801 device with an external P-channel MOSFET.

Two key points will determine what type of charger to use. First, is the efficiency (due to heat generation) important for the application? If so, a switching-regulator-based charger is the best choice. If not, then a lower cost linear charger would be better. Second, what will the system topology or partition be? If there is a separate AC/DC brick, then a DC/DC charger (either linear or switching) is appropriate. However, the system cost may be lower if the brick function is combined with the charger function. In this case an off-line charger application is the best. All three of these circuit approaches are detailed in the following sections.

A buck charger

The ADP3801 and ADP3802 are complete buck type switching regulator battery chargers/controllers. Fig.6 shows an application for a dual Li-Ion battery charger, pairing the ADP3801 with an external p-channel MOSFET. The 'BAT PRG MUX' allows one of six final battery voltages to be selected. These include one, two or three Li-Ion cells (4.2V, 8.4V and 12.6V) and three intermediate voltages for NiCad or NiMH cells (4.5V, 9.0V and 13.5V). Also, an input MUX allows the part to sequentially charge two independent battery packs, which could require different voltages.

When a discharged battery is first placed in the charger, the battery voltage is well below the final charge voltage, so the current sense amplifier controls the charge loop in

constant current mode. The charge current creates a voltage drop across the sense resistor RCS. This voltage drop is buffered and amplified by amplifier GM1. Amplifier GM2 compares the output of GM1 to an external voltage at ISET and servos the charger loop to make these voltages equal. Thus, the charge current is programmed using the ISET input. The output of GM2 controls the PWM duty cycle and the control loop. When the charge current is too high, the output of GM2 pulls the COMP node lower. It reduces the duty cycle of the PWM, decreases the charge current and provides negative feedback to complete the charge current control loop.

The output of GM2 is analog 'ORed' with the output of GM3, the voltage loop amplifier. As the battery voltage approaches its final voltage, GM3 comes into balance. As this occurs, the charge current decreases, unbalancing GM2, while control of the feedback loop naturally changes to GM3.

To guarantee 50.75% accuracy, a low drift internal reference and high accuracy thin film resistors are used. Including these components on-chip saves the significant cost and design effort of adding them externally. After the battery has reached its final voltage, the current tapers off, as shown in Fig.4(a). An internal comparator monitors the charge current and — when it drops below 80mA — the EOC (end-of-charge) output pulls low. This signal can be used by the system to show that the battery has completed charging.

The LDO section of the chip provides a 51% regulated output voltage for use either as a reference or as a supply voltage for external circuitry such as a microcontroller. The RESET pin gives a power-on reset signal if needed by a microcontroller.

Finally, pulling the SD pin low places the ADP3801 in low current shutdown with only the LDO in operation. This can be very helpful in such cases as momentarily stopping charge (while a phone call is coming into a cellular phone) to prevent switching noise from interfering with the RF signal and to reduce the supply current when the charger is not needed. For more information on the ADP3801/02, consult the data sheet.

An off-line charger

The ADP3810 and ADP3811 are ideal for use in isolated chargers. Because the output stage can directly drive an opto-coupler, feedback of the control signal across an isolation barrier is a simple task. Fig.7 shows a simplified flyback battery charger.

The primary side control IC is a standard current-mode flyback PWM controller. Its wide duty cycle range makes it a good choice for universal 70-270V AC operation and for the additional requirement of 0% to 100% output current control. This charger achieves these ranges while maintaining stable feedback loops. The PWM frequency is set to around 100kHz as a reasonable compromise between inductive and capacitive component sizes, switching losses and cost.

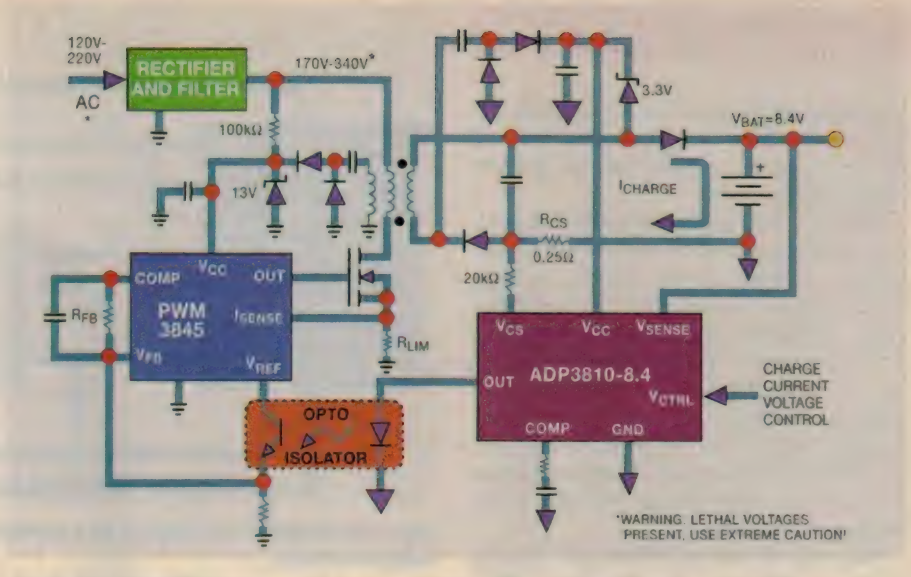


Fig.7: The simplified schematic for an off-line Li-Ion battery charger of the 'flyback' type, using an ADP3810 and a PWM3845.

The primary PWM-IC circuit derives its starting VCC through a 100 kΩ resistor directly from the rectified AC input. After start-up a conventional bootstrapped sourcing circuit from an auxiliary flyback winding would not work. The flyback voltage would be reduced below the minimum VCC level specified for the 3845 under a shorted or discharged battery condition. Therefore, a voltage doubler circuit provides the minimum required VCC for the IC across the specified AC voltage range, even with a shorted battery.

While the signal from the ADP3810/3811 controls the average charge current, the primary side should have a cycle-by-cycle limit of the switching current. This current limit has to be designed such that — with a failed or malfunctioning secondary circuit or opto-coupler or during start-up — the primary power circuit components (the FET and transformer) won't be over-stressed. As the secondary side VCC rises above 2.7V during start-up, the ADP3810/3811 takes over and controls the average current. The primary side current limit is set by the 1.6Ω current sense resistor RLIM connected between the power NMOS transistor and ground.

The current drive of the ADP3810/3811's output stage directly connects to the photodiode of an opto-coupler, with no additional circuitry. With 5mA of output current, the output stage can drive a variety of opto-couplers. An MOC8103 is shown as an example. The current of the photo transistor flows through the 3.3kΩ feedback resistor RFB, setting the voltage at the 3845's COMP pin and thus controlling the PWM duty cycle.

To minimize cost, a current-mode flyback converter topology is employed. Only a single diode is needed for rectification (MURD320) and no filter inductor is required. A 1mF (1000uF) capacitor filters the transformer current, providing an average DC current to charge the battery. Resistor RCS senses the average current, which is programmed by a DC voltage on the VCS input pin. In this case, the charging current has high ripple due to the flyback architecture, so a lowpass filter on the current sense signal is needed. This filter has an extra inverted zero to improve the phase margin of the loop. The 1mF capacitor is connected between VOUT and the 0.25Ω sense resistor.

To provide additional decoupling to ground, a 220uF capacitor is also connected to VOUT. Output ripple voltage is not criti-

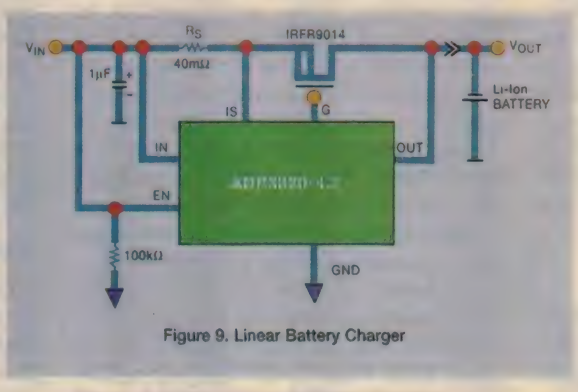


Figure 9. Linear Battery Charger

Fig.8: A linear Li-Ion battery charger using the ADP3820 controller IC driving an external P-channel MOSFET.

cal, so the output capacitor was selected for lowest cost instead of lowest ripple. Most of the ripple current is shunted by the parallel battery, if connected.

The VCC source for the ADP3810/3811 can come from a direct connection to the battery as long as the battery voltage remains below the specified 16V operating range. If the battery voltage is less than 2.7V (e.g., with a shorted battery or a battery discharged below its minimum voltage), the ADP3810/3811 will be in Under-Voltage Lock Out (UVLO) mode and will not drive the opto-coupler. In this condition the primary PWM circuit will run at its designed current limit.

The VCC of the ADP3810/3811 can be boosted using the circuit shown. The ADP3810's VSENSE pin is connected directly to the battery. This allows direct sensing of the battery voltage for the highest accuracy. The internal precision trimmed resistor divider, the internal low drift reference and the internal low offset amplifier all combine to provide the 51% guaranteed specification.

A linear charger

Fig.8 shows the ADP3820 linear Li-Ion battery charger controller. Its output directly drives the gate of an external P-channel MOSFET. As this circuit shows, a linear implementation of a battery charger is the simplest approach. In addition to the IC and the MOSFET, only an external sense resistor and input and output capacitors are required.

The charge current is set by choosing the appropriate value of sense resistor, RS. As with the ADP380x and the ADP3810, the ADP3820 includes all the components needed to guarantee a system-level specification of 51% final battery voltage. The ADP3820 has an internal precision reference, low offset amplifier and trimmed thin film resistor divider.

A universal charger

Many applications only require the charger to charge one specific battery. The form factor (physical dimensions) of the battery pack is usually unique, to prevent the plugging in of other battery types. However, some applications require the charger to handle multiple battery types and chemistries. The design for these universal chargers is fairly complicated because the charger must first identify the type of battery, program the charge current and voltage and choose the proper charge termination scheme. Clearly, such a charger requires some sort of microcontroller intelligence.

Fig.9 shows a simplified block diagram for a universal charger, using a microcontroller with the ADP3801. The microcontroller is used to monitor the battery voltage and temperature via its internal 8-bit ADC and multiplexer input. It also keeps track of the overall charge time. It may also monitor the ambient temperature via a thermistor or analog temp sensor. The ADP3801's LDO (low-dropout regulator) makes an ideal supply for the microcontroller, and the RESET pin generates the necessary power-on reset signal. The LDO can also be used as a 51% reference.

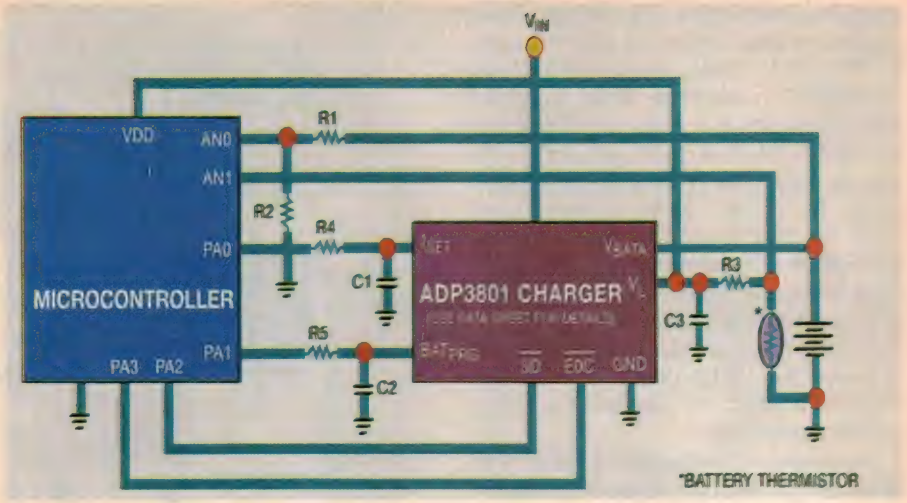


Fig.9: Simplified block diagram of a universal charger using the ADP3801 and a microcontroller.

When a battery is inserted into the charger, the first step is to identify the type of battery placed in the charger. The most common method of doing this is reading the value of the in-pack thermistor. Different values of thermistors are used to identify if the battery is Li-Ion or if it is NiCad/NiMH. This thermistor is also used to monitor the temperature of the battery. A resistor from the ADP3801's LDO to the battery's thermistor terminal forms a resistor divider and generates a voltage across the thermistor for the microcontroller to read. During this time, the ADP3801 should be in shutdown, which the uC controls via the SD pin.

When the battery has been identified, the microcontroller can do a prequalification of the battery to make sure its voltage and temperature are within the charging range. Assuming that the battery passes, the SD pin is taken high and the charging process begins. To program the charge voltage and charge current, two digital outputs from the uC can be used in PWM mode with an RC filter on the BAT PRG and ISET pins. A connection should also be made between the EOC pin of the ADP3801 and a digital input on the uC.

If the battery has been identified as NiCad/NiMH, the uC must monitor the voltage and temperature to look for $-\Delta V/\Delta t$ or $\Delta T/\Delta t$ criteria for charging. After this point has been reached, the charge current can be set to trickle charge. A timer function is needed to terminate charge if the charge time exceeds an upper limit. This is usually a sign that the battery is damaged and the normal termination methods will not work.

The ADP3801's final battery voltage should be programmed to a higher voltage than the maximum expected charging voltage. Doing so prevents interference with the NiCad/NiMH charging, yet still provides a limited output voltage in case the battery is removed. Meanwhile, the ADP3801 maintains a tightly regulated charge current.

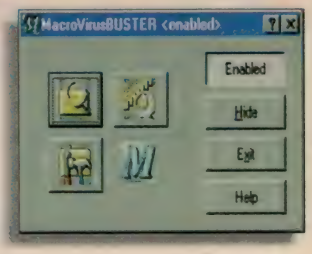
If the battery has been identified as a Li-Ion battery, the ADP3801 is used to terminate charge. The uC should monitor the EOC pin for the charge completion signal. In some cases, the charge is continued for 30 to 60 minutes after EOC to top off the battery. If this is desired — upon receiving the EOC — the timer function should be started. After the allotted time, the ADP3801 should be placed in shutdown to prevent constant trickle charging. By using the high accuracy final battery voltage limit of the ADP3801, the circuit can guarantee safe Li-Ion charging without requiring an expensive reference and amplifier.

Conclusion

Li-Ion batteries offer exceptional advantages in run time, size and weight. These advantages are leading to the widespread use of Li-Ion in applications formerly served by NiCad and NiMH batteries. Trends show the Li-Ion is already the main battery choice for portable computers, and the same will be true for cellular phones in the near future. As production of Li-Ion increases and their costs reduce further, additional applications will switch to this battery type.

Li-Ion charging does require high precision circuitry to guarantee safe and complete charging. Analog Devices offers a family of parts that satisfy the demands of Li-Ion while offering easy-to-use, cost-effective circuitry. These parts cover a variety of charger topologies, making the job of designing a Li-Ion battery charger easy. ❖

Leprechaun Macro Virus Buster



by Jean-Baptiste Cattley

Computer viruses have gained much attention in the past, and a healthy proportion of people now regularly run virus checkers on any new software they obtain. A fairly new addition to the viral 'gene pool' is the macro virus, which can wreak just as much havoc as an ordinary file or boot sector virus, but very few people bother to check for them. Here's where Leprechaun's new product comes in...

Unlike conventional viruses, which infect programs, macro viruses infect documents, such as Microsoft Word .DOC files. These tend to spread far more easily, because people tend to exchange documents far more readily than they exchange programs or disks.

Another thing going for macro viruses is that they are platform-independent; an infected document can harm a PC just as easily as it can a Mac. This is because all macro viruses (including the infamous Concept, DMV and FormatC) work along the same principles: auto-execute macros are inserted into the document, which use the built-in scripting language of the document's parent application to copy themselves into the application's default template. (*i.e.* Normal.dot for Word documents.) From there, they can infect all further documents edited.

As well as merely copying themselves, these nefarious little macros can do some very unpleasant things, such as deleting files or inserting rude messages into all your print jobs. Susceptible applications include Microsoft Word, version 6 and above, and virtually all of the Microsoft Office packages. Theoretically any application with a powerful scripting language could be affected, but so far, macro viruses seem to be limited to Microsoft Office products, probably due to their popularity.

Virus buster

Although there's a lot of anti-virus software out there, you'll have a hard time finding any that provide decent protection against macro viruses. This is where Leprechaun Software's Macro VirusBUSTER comes in. MVB is designed only to detect and clean macro virus infection in Microsoft Word documents, so you wouldn't want to give up your conventional virus checker right away.

Unfortunately, Leprechaun software reports compatibility problems with conventional antivirus software, so you may have to decide which kind of virus you fear the most. I found no problems running MVB in conjunction with VET Anti Virus, for example, but other software may not be quite so forgiving.

As well as giving you the option to manually scan directories for infected files, MVB installs a VxD into the operating system that checks all documents as they are accessed, guaranteeing that all documents are scanned before they can do any harm.

Installation

The software is supplied on two floppies, one for use on Windows 3.1x systems, and the other for Win95. There's also a Windows NT version available, but this wasn't supplied in the package I received.

I installed the Windows 95 version, which used InstallShield to set everything up, and as a result I was later able to uninstall it cleanly using the 'Add/remove programs' option in the control panel. Once installed, a blue 'M' icon in the system tray indicates that MVB is running, and that all office documents will be checked as they are opened.

Every time you open, close or save a Word document, MVB flashes a green tick mark in the top right hand corner of your screen, to indicate that it has checked the document and found no macro viruses. This is a little disconcerting at first, as it writes directly to the screen instead of using a conventional window or dialog box, but you soon get used to it.

Manual scanning is quite straightforward — a button on the MVB main window brings up a directory requester, allowing you to select a directory to scan. Interestingly, if you want to scan a single file, you have to find it in Explorer and drag it on manually; surely a standard file requester instead of a directory requester would have been more appropriate? Once manual scanning has finished, MVB proclaims in a broad Australian accent "The scan was completed with no problem". This is fun at first, but after the fifth repetition, it wears somewhat... Luckily, there is a way to turn it off in the setup panel.

Perhaps the most interesting aspect of Macro VirusBUSTER is that along with normal virus signature scanning, (as used by conventional virus checkers) it uses a process called Heuristic Scanning. In this mode, MVB looks at the actual code contained within any Word macros, and tries to determine whether that code could do anything harmful; in this way, it can theoretically detect previously unknown macro viruses. For this reason, Leprechaun Software have splashed 'No upgrades needed!' across the box, but I'm sure that a new version of Office will fix that soon enough...

In actual use, Macro VirusBUSTER is transparent, fast and inconspicuous. I've had it running for the best part of a month, and haven't come across any problems. The only real gripe I have is the potential compatibility problems with conventional virus checkers; a little more information in the manual on this point would have been useful, but I certainly haven't struck any problems — and the knowledge that the next piece of email I receive won't eat my hard drive is certainly reassuring. ❖

Macro VirusBUSTER

Macro Virus protection for Microsoft Word documents.

Good points: Fast, transparent operation, minimal setup.

Bad points: Possible problems with other anti-virus software.

Availability: Leprechaun Software Australia, PO Box 826, Capalaba QLD 4157. Phone (07) 3823 1300; fax (07) 3823 1233, email info@leprechaun.com.au; website at http://www.leprechaun.com.au.

Computer

News & New Products

USB-based instruments

National Instruments claims to be the first to introduce instruments that connect to Windows 95 PCs via the Universal Serial Bus (USB). The family of instruments includes a two channel, deep memory digital oscilloscope (NI 5102); a 5-1/2 digit multimeter (NI 4060) and a high-precision temperature and voltage measurement instrument (NI 4350). The instruments are compatible with industry-standard software packages including LabVIEW, LabWindows/CVI, Visual C/C++, and Visual Basic.

All of the USB-based instruments are compatible with Windows 95 (OSR 2.1) and Windows 98. Each instrument includes instrument drivers and the appropriate accessories, cables, and probes.

The NI 5102 digital oscilloscope's features include 20MS/s real-time maximum sample rate; 1GS/s random interleaved sampling (RIS); 15MHz input bandwidth; 663,000 sample record length; two input channels, one analog trigger; 50mV - 5000V input capability; and 8-bit vertical resolution.

The NI 4060 digital multimeter's features include 5-1/2 digit DMM with AC/DC coupling; true-RMS AC measurements, 20Hz - 25kHz; DC and AC input ranges of 20mV - 250V; and resistance measurements of 200Ω to 20MΩ.

For more information circle **161** on the reader service card or contact National Instruments Australia, PO Box 466, Ringwood 3134.

CD Writer drive from Kodak

Kodak's new Digital Science 2801IDE CD Writer allows PC users to take advantage of the low cost and high capacity that CD-R media provides, along with the very latest in CD-R recording software technology.

The 2801IDE CD Writer has several new features over its predecessor, the 2600IDE. The 2801IDE is an 8X read unit, has improved software functionality, help features, user interface and audio writing capabilities. The new Writer also has an improved installation manual to ensure a trouble-free installation process.

The 2801IDE CD Writer is an internal ATAPI-IDE unit that is 2X speed write and 8X speed read. It is aimed at both mainstream and high-performance personal computer users and is ideal for desktop/web publishing, software developers, small office/home office, business professionals and home users. It simply plugs into the IDE port available inside most IBM compatible PCs.

The software provided is CeQuadrat's latest offering, CeQuadrat ToGo! 4.5 along with CeQuadrat Packet CD. The Packet CD software allows users who want to share and store their information to treat their CD-R

disc just like any floppy disk or hard disk drive by using the 'File Save' feature of their existing software, or simply dragging and dropping their files.

The 2801IDE CD Writer measures 147 x 211 x 41mm and has the same form factor as a half-height 5-1/4" floppy drive. It's available for around $617 through a wide network — including retailers, camera dealers, catalogues and traditional computer dealers.

For more information circle **160** on the reader service card or contact Kodak Digital & Applied Imaging, 173 Elizabeth Street, Coburg 3058.

Fast Ethernet link tester

The LanMaster Model 20 Link Tester provides LAN installers and technicians a tool to quickly test active Links in Fast Ethernet (100baseTX) and Standard Ethernet (10baseT) networks. In just three seconds, the LanMaster 20 verifies Link operation, identifies Fast Ethernet capabilities of installed equipment and displays reported fault status. The Model 20 also retails for only $395, which is claimed to make it the most affordable Fast Ethernet test instrument available on the market.

The Fast Ethernet (IEEE 802.3u) standard defines several new operating modes and technical capabilities for LAN products. Auto-sensing, Auto-negotiation and Full Duplex operation are some of the new features that dramatically increase network performance and maintainability. These enhanced modes and capabilities are only optional requirements to the IEEE 802.3u standard and installed equipment can have very different levels of Fast Ethernet support. These features can also be configured during installation or operation further increasing the difficulty of maintaining or upgrading a network. The LanMaster 20 Link Tester provides important configuration and fault information by detecting and decoding Link signals transmitted by the far-end equipment. The decoded configuration and fault information is displayed to the user through eight backlit display cells.

The LanMaster 20 reduces Move, Add and Change (MAC) problems by quickly verifying connectivity and wiring polarity for a new or modified network Link. It sim-

plifies troubleshooting by confirming physical layer operation for an active Link and improves network management by providing equipment configuration information needed to optimize system performance.

The handheld unit is light (110g) and small (175 x 38mm), making it a natural addition to a Network Maintainer's tool kit. The unit is easy to operate with all tests performed by a single press of a button. One 9V battery powers the product and an RJ-45 coupler is included for connecting to a patch cable.

For more information circle **162** on the reader service card or contact Jamsam Pty Ltd, Suite 202 James Hardie House, 65-69 York Street, Sydney 2000.

Aussie microPLC for OEM users

Just released in the all-Aussie SPLat range of microcontrollers is a model designed specifically for OEM users. The easily programmed and operated microPLC offers manufacturers a cost effective alternative to fully custom-built controllers and saves on engineering costs.

The MMI88 is based on a general purpose SPLat controller — for timing, counting, sequencing and digital control functions. It features an inbuilt operator interface that is specially tailored, with a polyester graphics overlay, for the 'look and feel' needed in the end application.

Designed by Microconsultants in Victoria, the MMI88 is designed for machinery manufactured in small to medium volumes. The system shortens the time needed to develop a product and get it into the market place.

With a combination of eight inputs, eight outputs, eight timers and a high speed counter, plus five pushbutton switches, seven LEDs, a beeper and two configuation jumpers, the MMI88 performs simple to

complex control functions. Microconsultants' OEM support team also offers a programming service to get manufacturers going even faster.

For more information circle **163** on the reader service card or contact Microconsultants, 2/12 Peninsula Boulevard, Seaford 3198.

Recordable DVD-R and DVD-RAM media

TDK has announced DVD-R and DVD-RAM recordable and re-recordable discs. Although not available in Australian yet, TDK (Australia) will meet market requirements as they develop.

Offering storage capacity up to 5.2GB (DVD-RAM double sided), the media employ the latest in optical storage development technology. Compatible with current DVD-R recordable drives, TDK's DVD-R uses a metal stablised cyanine dye as the recording layer and gold as the highly reflective layer. These integral layers are bound together by a proprietary UV curing resin bonding process that also aids in protecting the disc.

TDK's DVD-RAMs are a rewritable DVD media offering storage capacity of 2.6GB (single sided) and 5.2GB (double sided). Designed to be re-writable for up to 50,000 times, the discs employ a Ge amorphous alloy in the phase change layers (recording layers) and aluminium for the reflective layers. The four-layer construction is secured in place by a proprietary UV curing resin bonding process.

For more information circle **164** on the reader service card or contact TDK Australia, 22 Lambs Road, Artarmon 2064.

Dual platform A3 Bubble Jet printer

Canon has released the new BJC-4650, claimed as the industry's first A3 Bubble Jet printer for PC or Mac to offer users full colour scanning (optional) and PhotoRealism printing capabilities from a desktop printer.

The BJC-4650 is the only printer in its class that is easily converted from a printer into a colour scanner. The optional scanner cartridge is substituted for the ink cartridge, turning the printer into a colour scanner capable of scanning resolutions up to 360dpi. This facility can be used to scan images up to A3 in size, into a Windows 95 compatible computer.

The BJC-4650 also achieves near silver halide photographic output using Canon's unique PhotoRealism and Drop Modulation Technology.

By replacing the colour cartridge with the black ink cartridge, the BJC-4650 produces high speed, sharp, true black text documents. Users can accomplish speeds of up to 4.5 A4 pages per minute in high-speed mode, and with the text smoothing function documents are near laser quality.

The BJC-4650 has an RRP of $599 and comes complete with a four-colour ink cartridge, a photo ink cartridge, five sheets of glossy photo paper and a cartridge storage container. Also available is the optional scanner cartridge priced at $149 and a black ink cartridge for $58.

For more information circle **165** on the reader service card or contact Canon Australia, 1 Thomas Holt Drive, North Ryde 2113.

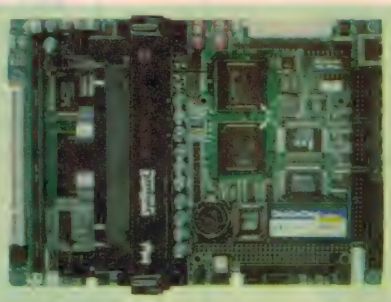
Keyboard and mouse adaptor

PI Engineering's Keyboard and Mouse Adapter is an active device that allows the simultaneous use of both a full-size keyboard and normal mouse on a notebook computer.

The adapter works with all notebooks that feature a PS/2 keyboard/mouse port. It requires no external power supply, drawing power directly from the notebook port. Driver software is included for Windows 95 and Windows 98. No additional IRQ's or com ports are required.

Suggested retail price is A$129 including tax, with a 12-month warranty.

Pentium II based Little Board SBC



Aaeon Technology has released the PCM-7890 Pentium II Little Board single board computer, with on-board CRT/LCD controller and the new DiskOnChip Flash Disk. The on-board 100BaseTx Fast Ethernet interface, TV output and Sound Blaster compatible audio opens up worlds of possible applications for kiosks, gaming systems, POS systems, medical and educational products.

The ultra compact board packs all the functions of an embedded PC on a single board, but fits in the space of a 5-1/4" floppy drive. The on-board C&T 69000 is a high performance LCD/CRT Windows accelerator incorporated with 2MB SDRAM for graphics/video frame buffer. It supports a wide range of flat panel displays, including 36-bit TFT LCD displays allowing simultaneous viewing of LCD/CRT and TV display.

The built-in DiskOnChip supports system boot-up and memory storage up to 72MB. The fast Ethernet provides a tenfold increase in network capability; it is fully compatible with 10Mb/s network facilities. High quality sound requirements are also provided for, with an on-board PCI bus ES 1371 sound controller which is compatible with Sound Blaster, Sound Blaster Pro and Windows Sound System.

Also included are four high speed serial ports (three RS-232, one RS-232/422/485), one multi-mode (ECP/EPP/SPP) parallel port, a floppy drive controller, an Ultra DMA/33 enhanced IDE controller and a keyboard/PS/2 mouse interface.

For more information circle **166** on the reader service card or contact Amtex Electronics, 2A Angas Street, Meadowbank 2114.

For more information circle **167** on the reader service card or contact BJE Enterprises, 124 Rowe Street, Eastwood 2122.

Rugged multi-axis joystick

Developed for use in those applications where lever strength and handle functionality are paramount — like virtual reality systems — the Penny & Giles JC600 is a large, robust, multi-axis joystick that can be easily tailored to your application.

Designed for use with electronic controllers, conductive plastic tracks inside the JC600 generate analog and switched reference signals proportional to the distance and direction over which the handle is moved. A centre tap on the analog track provides an accurate voltage reference for the centre position or a zero point for a bipolar supply voltage.

The JC600 range of ergonomic handles feature potentiometers, for three and four axes of control, switches, membrane keypads or LED displays. Deadman switches or a centre lock option can be specified to improve the integrity of a control system. Installation time has been reduced through the use of standard electronic connectors. System cost can be further reduced by replacing the JC600 interface board with a CANBUS or PWM controller.

With an expected life in excess of five million cycles and designed to meet a 1kV voltage test, the JC600 is currently specified by manufacturers of access platforms, agricultural, construction, mining and material handling equipment.

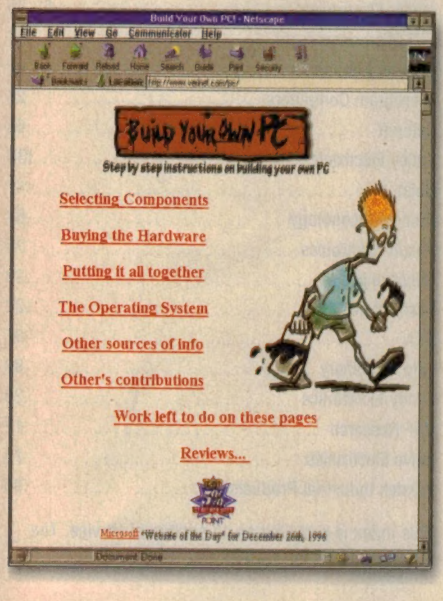
For more information circle **168** on the reader service card or contact Control Devices Australia, Level 1, 150 William Street, East Sydney 2011. ❖

Web watch

by Graham Cattley

BUILDING YOUR OWN PC really isn't that difficult you know, especially after looking through Jeff Moe's site at **http://www.verinet.com/pc/**. He takes you step by step through deciding what you want, buying the bits, putting it all together and so on. Just about all the pages warn you that "...the info on this site is really old", but it covers 686's at 150MHz, so it isn't *that* out of date. Besides, most of the info here is relevant, no matter what speed CPU you're running.

He also has lots of useful links, and a separate updates page for submitted material that hasn't had time to intergrate into the site.



All up, a useful, informative site that will appeal to anyone contemplating building a computer from scratch, or simply upgrading.

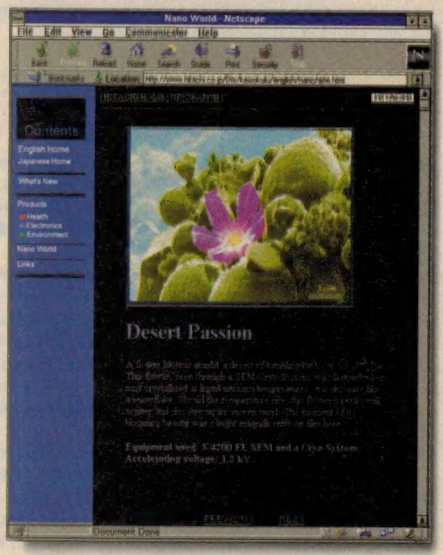
CAR AUDIO is always a hot subject, and the mobileaudio.com site (at **http://www.mobileaudio.com/**, of course) can give you heaps of stuff on the subject, mainly via their rec.audio.car FAQ (yes, from the Usenet newsgroup).

Their White Pages list the sites of people around the world where you can see other installations and even email other car audio enthusiasts. There are details of upcoming 'sound-off' competitions (mostly in the US), a colourful report of the new car audio products at the recent ICES, and links to car audio retailers online. So if you see your car as merely a speaker box on wheels, this site should be of great interest.

THE ELECTRONICS PLUS web site at **http://home.maine.rr.com/randylinscott/** covers a fair amount of ground, with sections on the operation of faxes and photocopiers (both of which are very good), cable descrambling, and several simple projects to build. It's worth a look.

DOES YOUR COMPUTER have LRF support? Do you know what LZW stands for? and should DR.BOND be using FOSSIL on the LAWN? Don't know what I'm talking about? Go to **http://www.access.digex.net/~ikind/babel.html**, where Irving Kind maintains the biggest acronym and abbreviation index that I've ever seen. It comes as a huge single page, so you'll have to wait for all of it to load in before you start searching — or you can FTP the zipped text version from **ftp.access.digex.net**. Irving updates it three times a year, and so the whole thing is quite compehensive and up to date. (Although I couldn't find LRF, which stands for Little Rubber Feet...)

THE NANO ART GALLERY at **http://www.hitachi.co.jp/Div/keisokuki/english/nano/arte.html** is very good — Cherry Blossoms in a Clear Stream is quite beautiful, as are the Gold Moon and Desert Passion photos. They're photomicrographs of course, but taken out of context and suitably coloured they take on a whole new meaning. It's all very Japanese, and well worth the effort of typing in the long URL.



CONSIDER THIS the next time you are online: one white pixel uses up 34,475,867,928 electrons per second. An average 14" screen uses 18,237,881,012,857,875,948,329,134,987 electrons per second. These electrons are destroyed and cannot be used again. See what's being done to save the electron at **http://www.andrew.cmu.edu/~jjs2/electrn.html**

IF YOU ARE HAVING TROUBLE with your VCR, then why not pay a visit to **http://bradley.bradley.edu/~fil/vcr.html**, where Philip Kuhn offers a listing of Q&As on just about every aspect of owning and operating a VCR. An interesting image map indexing system takes you quickly and easily to the relevant section, with useful hints and tips on the section of VCR that you clicked on.

And if you are *still* one of the many suffering from a blinking 12:00 on your VCR, check out **http://www.soundsite.com/vcr/vcr.html**, which covers the time setting procedures for a multitude of popular domestic VCRs. ❖

EA Directory of Suppliers

Which of our many advertisers are most likely to be able to sell you that special component, instrument, kit or tool? It's not always easy to decide, because they can't advertise all of their product lines each month. Also, some are wholesalers and don't sell to the public. The table below is published as a special service to EA readers, as a guide to the main products sold by our retail advertisers. For address information see the advertisements in this or other recent issues.

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KEY TO CODING

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Note that the above list is based on our understanding of the products sold by the firms concerned. If there are any errors or omissions, please let us know.

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SUBSCRIPTIONS: All subscription enquiries should be directed to: Subscriptions Department, Federal Publishing Company, P.O. Box 199, Alexandria 2015; phone (02) 9353 9992.

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PCB PATTERNS: High contrast, actual size transparencies for PCBs and front panels are available. Price is $5 for boards up to 100sq.cm, $10 for larger boards. Please specify negatives or positives.

PROJECT QUERIES: Advice on projects is limited to postal correspondence only and to projects less than five years old. Price $7.50. Please note that we cannot undertake special research or advise on project modifications. **Members of our technical staff are not available to discuss technical problems by telephone.**

OTHER QUERIES: Technical queries outside the scope of 'Replies by Post', or submitted without fee, may be answered in the 'Information Centre' pages at the discretion of the Editor.

READER SERVICES BULLETIN BOARD: (02) 9353 0627; ANSI, 24 hour access; any rate to 28.8kb/s.

PAYMENT: Must be negotiable in Australia and payable to Electronics Australia. Send cheque, money order or credit card number (American Express, Bankcard, Mastercard or Visa card), name and address (see form).

ADDRESS: Send all correspondence to: Reader Services Co-Ordinator, Electronics Australia, P.O. Box 199, Alexandria NSW 2015; phone (02) 9353 0620. (E-mail to ea_readerservice@hannan.com.au)

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Credit cards accepted:

Mastercard, American Express, Visa Bankcard (please circle applicable card).

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ADVERTISING INDEX

This index is provided as an additional service. The publisher does not assume any liability for errors or omissions.

Notes & Errata

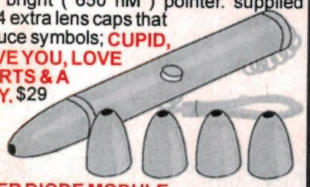
Forum column (July 1998): The telephone number given for Melbourne firm Bio Electronics is wrong; it should be (03) 9370 6729.

240V Variable Frequency Drive (July 1998): In the schematic diagram on page 57, rectifier bridge B1 should be rotated clockwise by 90°; also zener diode Z2 is reversed. The PCB overlay is correct.

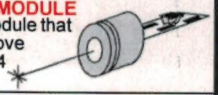
Motorcycle Intercom (July 1998): Capacitor C2 should be a 10uF electrolytic, not 1uF as shown in the schematic. The parts list and overlay diagram are correct.

$10 Wonders (June 1998): In the stripboard overlay on page 67, the LED anode should connect to J6, to connect to R3. Also the flying lead should connect to track H11, not F12 as shown. Thanks to Ted Kilminster for advising of these errors. ❖

LASER DIODE POINTER (Key-chain) Very bright (650 nM) pointer. supplied with 4 extra lens caps that produce symbols; **CUPID, I LOVE YOU, LOVE HEARTS & A LADY.** $29

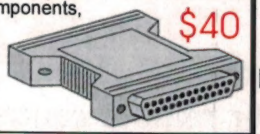


LASER DIODE MODULE Same quality module that is used in the above laser pointer: $24



NEW POCKET SAMPLER KIT FOR PC'S THAT FITS INTO A Db25 HOUSING. Data logger/sampler plugs into your Pc's parallel /printer port & takes samples over a 0-2V or 0-20V range. Samples can be taken at intervals from one per hour down to one per 100uS. Useful, for example, to monitor battery charging. It can also be used as a basic low frequency (to about 5KHz) oscilloscope! Our kit includes all onboard components, PCB, Db25 housing & the software on a 3.5" disk: (K90) $25

$40



PC Data Acquisition Unit Use the parallel port of your PC as a real world interface. It enables your PC to both monitor & control external events and devices. The world is a mixed analog & digital world. With the appropriate sensors the PC can monitor physical variables such as pressure, temperature, light intensity, weight, switch state, movement, relays, etc, process the information and then use the result to control physical devices such as motors, sirens, other relays, servo motors (up to 11) & two stepper motors :$200

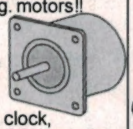
************CLEARANCE SPECIAL********** **UHF AUDIO-VIDEO TRANSMITTER.** Your own mini Tv broadcast station. Send video from VCR's or cameras to TVs in your home. Inc. Metal case telescopic antenna & leads: 12V operation, tunable (G01) $20 or $15 with camera purchase

$15

We HAVE NEW STOCKS OF STEPPER MOTORS 30 oz./in. TORQUE, 2.5 DEG. (144 STEP), LOW VOLTAGE, COMPACT 57 X 38MM

****** TWO GREAT SPECIALS ******
*****STEPPER MOTOR DRIVER KITS*****
COMPUTER CONTROLLED STEPPER MOTOR KIT: can drive larger motors with optoisolation. Inc. software and notes: $50 or $65 with two used 2.5 deg. motors!!

STEPPER MOTOR DRIVER KIT Kit inc. a large used 2.5 deg. (144 step / rev) motor & uses SAA-1042A IC. Controls inc. ext. clock, on-board clock logic CW or CCW rotation, half or full step, enable/disable, clock speed1 motor: $25 or 2 motors:$35



SOLID STATE 4-6A PELTIER EFFECT COOLER / HEATER 3.3A@14V PELTIER: $27, 6A @15VPeltier: $35, both are approx. 40X40X4mm, can be temperature controlled by reducing supply voltage /current, will even work from a 1.5V battery!! We supply Peltier Effect device, data sheet, diagram & circuit for a small fridge / heater.. Other requirements; Insulated box, 2 large heatsinks, & a small aluminium block. This device is used in the common 15Lr car fridge. Peltier effect Device:(G02) 12V DC Fan:(G11)

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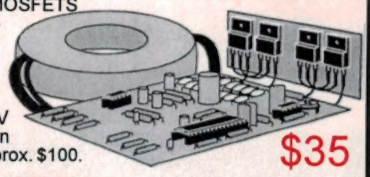
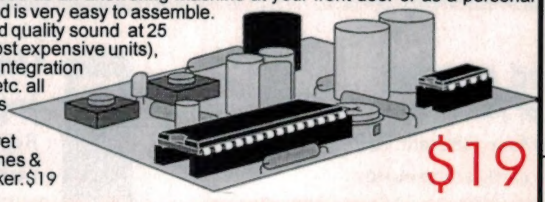
KITS OF THE MONTH

12VDC - 240AC INVERTER Features include modified square wave output, Auto start with load sensing, Uses six power MOSFETS with minimal heatsinking required. 200 - 600VA. dependant on trans former size. To save money you can use an rewind your own transformer. Basic kit includes pcb & all on-board components + 4 60A MOSFETS. $35 Requires 240V to 8-0-8 V transformer. Low profile case + Australian made 300VA. (cont.) trans-former for approx. $100.



$35

20-30 SECOND SOUND / VOICE RECORDER KIT. This kit could be used as an answering machine at your front door or as a personal reminder device and is very easy to assemble. Produces very good quality sound at 25 sec (better than most expensive units), Uses Large Scale Integration chip with memory etc. all built in. Kit includes PCB, all on-board components, electret microphone, switches & small surplus speaker.$19



$19

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DON'T MISS THE BARGAINS NOT SHOWN IN THIS AD ON OUR BARGAIN CORNER PAGES (UPDATED REGULARY) OVER 25,000 HITS PER WEEK.!!!

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SOON TO BE (oatleyelectronics.com)

FM TRANSMITTER 33 x 23 x 10mm In a small black metal case. Built in switch & microphone. Specs.: 88 to 108- MHz (adj.), with a wire ant. bat. life 60 hrs, Range 50M:(G14) $39 (Std. watch battery LR44, inc.)

HIGH RESOLUTION MONITOR Brand new 240V 30cm enclosed computer monitor + video conversion kit. Gives better resolution than TV! Limited good qty. BARGAIN PRICE.

$60

MODEL TRAIN CONTROLLER KIT: Ref: SC Jul 95. Allows two trains to run on one track, without hitting each other due to speed difference. When a train breaks an IR beam it switches off power to a portion of track, until the other train catches up & breaks another beam at another location. It uses a relay to switch sections of track. Main PCB: 96 x 66mm, IR Sensing PCB's: 59 x 14mm: (K58) $28

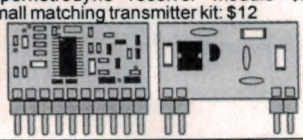
TRANSISTOR SPECIALS
BU-205
HIGH VOLTAGE
$2.50
2SD-1554
HIGH VOLTAGE
$5.00

****SPECIAL**SPECIAL**SPECIAL****
FOR $1 EXTRA WITH EACH ORDER WE WILL SEND A WIRING KIT !!! Great for cars, radios mobile phones, fog lights etc. 4 colours, 2 guages of wire, Spade connectors, fuse holders, fuses. 17+ mtrs. of wire. **Limited offer!!! just $1**

***** SPECIAL BARGAIN *****
12V/7Ah GEL BATTERY BARGAIN Fresh stock of NEW standard battery $22

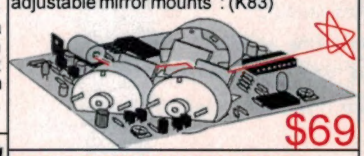
NEW ! 4Ch. UHF LEARNING REMOTE Can be programmed as a spare for your current remote or to replace up to 4 other units and combine into 1:(TX1) $39

UHF DATA TRANSMISSION Stamp sized Xtal locked 433.9MHz superhetrodyne receiver module $25 Small matching transmitter kit: $12



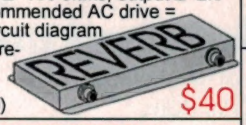
FRONT SURFACED MIRRORS High quality mirrors 160x22x2.5mm. with some minor blemishes Ideal for laser & other optical projects $5

AUTOMATIC LASER LIGHT SHOW KIT: MKIII. Similar kit as per SC. May 96, The display changes every 5 - 60 secs, & is manually adjustable. For each displays there are 8 speeds for each of 3 motors, one motors can be reversed in direction, & one motors can stopped. There's countless interesting displays which vary from single to multiple flowers, collapsing circles, rotating single and multiple ellipses, stars, etc. Now with no more mirror and motor alignment hassleswith motor mounting on the PCB and mirrors now align with "Allen Key". Kit includes PCB, all on board components, three small DC motors, mirrors, precision adjustable mirror mounts : (K83)



$69

PRO. STUDIO QUALITY REVERB Three spring units. Dim.: 425 x 110 x 33mm. Input Z=190 ohms, output Z=2.6 k ohms, recommended AC drive = 6.5 mA. A circuit diagram of a stereo pre-amp tested using this unit:$40(A10)

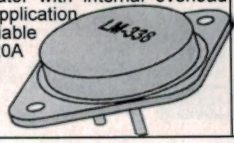


$40

***** CCD CAMERA SPECIAL ***** The best "value for money" CCD camera on the market! 0.1 lux, High IR response & high res. Performs better than many cheaper models. **WITH A CHOICE OF 1 OF THESE LENS** Pinhole (60deg.), ;78 deg.; 92 deg.; 120 deg.; $89 or 150 deg: $99

HIGH QUALITY DC MOTORS 3V - 8v DC motors with feedback winding for speed sensing ect. 40mm diameter X35mm long $3

***** HALF PRICE SUPER SPECIAL***** Lm338 adjustable (TO3 package) 5A voltage regulator with internal overload protection, + application notes for a variable 1.2V- 33V 5-20A power supply. Half price at just $6 Ea or 4 for $16



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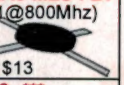
***** NEW *** NEW *** NEW *** HIGH POWER IR TRANSMITTER AND RECEIVER** Applications include data transmitter, powerful Passive infrared detector, IR invisible fence / gate & doorway monitor. Range: with 5 IR LEDs (can drive up to 50 LEDs) passive mode 10m (5 LEDs), active mode 40m (5 LEDs). Range can be boosted with a cheap torch reflector. The kit has active high & active low outputs for relays etc Simple to construct PCB can be cut into two for active mode or for data transmission. Kit inc. PCB, all on-board components, 5 IR LEDs + salvaged new plastic case All for $28

TELLEFUNKEN DUAL GaAs-MES-FET Cf300, LOWNOISE (NF=1.1@800Mhz) Would make extremely low noise RF amp (Gps 23db). With brief info. $3 Ea or 5 for $13



***** $2 ** YES ** $2 *** VHF VIDEO 1-2 MINI MODULATORS WITH EVERY CAMERA YOU BUY OR HAVE BOUGHT IN THE PAST. INC DATA SHEET:$ 2** (Rm2). This unit will fit neatly with our camera in our 50x 50x50mm case + swivel mount strong adjustable universal bracket : $4 Bracket only :$1.50

***** FANTASTIC BARGAIN *** COMPUTER POWER SUPPLY PCB:** New assembly. 45 x 108 x 200mm. 120 / 230V AC input. DC outputs are +5V@ 6A,+ 12V @ 1A,-12V@1A,-5V@1A. Data Inc.RU approval. Mains input. Be Quick: (Ps6) $12 ea. or 4 for $36

IR RECEIVER FRONT END MODULE This device contains an IR receiver diode, an amplifier tuned to 38KHz, a bandpass filter, an AGC section & detector circuit. $2 Ea or 10 for $15

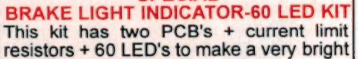
PLASMA DISPLAY BALL KIT: High Power High Frequency EHT generator that will give an exciting plasma discharge with a std light bulb or make Jacobs Ladder or Laden Jar & other EHT applications. Can be converted to a DC. Supply with a HV diode. Inc. EHT transformer + PCB + all on-board parts & 1KV. fast Diode + application notes. Req 12V @ 0.5-2A. Special price $29. 16KV. Diode $1.50

$29

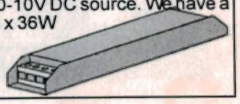
BRAND NEW STD LCD DISPLAYS
1 line x 16 char. : $16
2 line x 16 char. with LED back-light:$24

NEW HITACHI LASER DIODES 40mW / 785 nM For scientific, medical and industrial applications : $65 35 mW / 650 nM : $90

***** SPECIAL *** BRAKE LIGHT INDICATOR-60 LED KIT** This kit has two PCB's + current limit resistors + 60 LED's to make a very bright brake light etc. 600mm long: $15



***********CLEARANCE SPECIAL***********
FLUORESCENT LIGHT HIGH FREQUENCY BALLASTS
European made, new, "slim line" case high frequency (HF) electronic ballasts. Flicker free starting, long tube life, high efficiency, visual flicker during operation. Reduced radio frequency interference. Similar design to one published in the Oct. 94 Silicon Chip, although these are much more complex. Dimming requires external 100K pot or a 0-10V DC source. We have a limited stock 1 x 36W tube, 28 x 4 x 3 cm: (G09F) just $18



Reader Info No 34

Where do you go for the best range of remote controls?

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Integrates up to four different controls into one ultra-slim credit card size remote. Pre-programmed and easy to use.

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digitor

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digitor FOX

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digitor

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Great new design!

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G 1271

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$89.95

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Backlit, and replaces up to 4 remotes. Pre-programmed for TVs, VCRs, cable boxes and CD players.

G 1261

$79.95

1 for 6 universal remote control

Pre-programmed and easy set up. Controls TVs, VCRs, cable boxes, audio appliances and Teletext. Replaces up to 6 remotes. G 1240

$99

Universal remote control A/V producer 1 for 8

Access up to 8 devices from one remote! Pre-programmed unit includes backlit keypad, LCD and home theatre mode.

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